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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

London's Tempelhof?

THAT London should have an airport worthy of the greatest city in the world few will deny. That Croydon can be considered to meet the case fewer still will claim. One must therefore have a great deal of sympathy with the City Fathers, who wish to establish an airport covering nearly 1,000 acres, and having, according to recommendations made in a report by those well-known aerodrome experts, Norman and Dawbarn, four main runways 2,000 yards in length.

But we do very much question the wisdom of locating London's great airport of the future at Fairlop, near Ilford. The distance from the centre of London is not great, and when the Ilford loop line is taken over by the London Passenger Transport Board the journey to Fairlop could probably be made quite quickly. The actual distance from the Bank station is only something like 12 miles and the site is served by two important arterial roads. The value of the suggested airport would, however, depend entirely on fast and frequent electric railway connections.

One important objection to the Fairlop site is that it lies east-north-east of London. As the prevailing winds are from the south-west, all the smoke and murk is blown in that direction. Even if blind landing and blind take-off are counted on to become far safer and far more reliable than they are at present, one cannot view with any sort of equanimity the concentration of a very large percentage of London's air traffic in an area where QBI conditions are likely to be the rule rather than the exception.

Another objection—equally important to our mind—is that the casual spectator, who is the future airline traveller, is not likely to be attracted in the way that he or she should be. Such spectators usually arrive by road and are often on the way to some other spot. The attraction of Fairlop Plain may or may not be considerable, but the vast majority of motorists, for instance, tend to travel southwards or westwards during the week-end.

Finally, the "London" seen by Continental visitors on the coach run between Croydon and Victoria is dingy and depressing enough on certain sections. What of the first impressions of a visitor travelling through even less attractive areas?

Dive Bombing

AIR CHIEF MARSHAL SIR HUGH DOWDING made a very striking, not to say startling, remark at the meeting of the Royal United Service Institution last week. Sir Hugh was in the chair during the reading of Air Commodore Hearson's paper on Balloon Barrages, which is reported on pages 608-609. At the conclusion of the discussion Sir Hugh remarked that dive bombing was not now very practical in the R.A.F., because modern aeroplanes reached such a high speed in a dive that it would be very difficult to pull them out, if indeed they did not break up in the air.

Coming from such an authority, on such an occasion, these words must be accepted as authoritative. Sir Hugh, we may remind our readers, is the Air Officer Commanding-in-Chief the Fighter Command, and as such he is responsible for the whole of the air defence of the country, including No. 30 (Balloon Barrage) Group. It goes without saying that every possible form of air attack and its antidote must be studied by him and his staff, and that he knows the considered opinions of the pilots of our own bomber squadrons. When Sir Hugh Dowding says that dive bombing is not very practical in the R.A.F. just now his opinion must be accepted. His words gain additional weight from the nature of his audience, which consisted of officers, serving or retired, of all three fighting Services.

At the same time it seems necessary to point out that Sir Hugh's remarks should not be taken as a criticism of designers. The Air Ministry issues specifications, and the machines built to these specifications have to comply with all Air Ministry requirements in the matter of load factors, materials and so forth. If the load factors are inadequate, as one would infer from Sir Hugh's expression, the explanation seems to be that the technical departments at the Air Ministry have failed to pay sufficient attention to the requirements of the squadrons. What is obviously wanted is either some form of air brake which will make it possible to dive the modern clean machines without gaining excessive speed, a type of flap which can be so set for diving as to cause a great increase in drag, or a reversible-pitch airscrew.

The Wider View

IF, therefore, it is to be assumed that dive bombing may be disregarded for the present as a form of attack against ships, cities or other targets, ought Britain as a nation to mourn or to rejoice? The Air Ministry always insists that the counter attack by our bombers is the most formidable feature of our air defence scheme. Now, it appears, all bombers, including our own, have lost one arrow out of their quiver. Therefore, our defence must be weakened. On the other hand, as it seems that enemy bombers will not be able to obliterate their targets in London, Birmingham or Hull by diving on to them to make sure of their aim, our cities are to that extent safer than they were before the appearance of aircraft of high "aerodynamic cleanliness."

Of course, the gradual flat dive, possibly in spirals, to a low altitude above the target still must be a possibility, but such a manœuvre would not present nearly such a difficult problem to the defence. Guns and fighters alike would have a good chance of countering such an attack. Nor must we forget Air Commodore Hearson's balloons, "field sited" as they will be, and moored by lethal cables. They will, he practically assures us, rule out all low flying over our cities.

For the moment it would appear that air defence has a good chance of getting even with air attack, and perhaps of mastering it—which drives us back again on the paradox that attack is the best form of defence, and that, therefore, to weaken the attack is to weaken the defence. But the final conclusion is that Britain was safer before the invention of the aeroplane, that the bomber is the most formidable aeroplane, and therefore that the complete defeat of the bomber would restore Britain to her former insular security.

The New Technique

ALTHOUGH we are a very long way from the time when it will be possible to pour a thin paste into a mould, knock away the mould and extract the finished wing or fuselage, recent progress in the application of thermo-plastic and thermo-setting materials justifies the belief that aircraft construction may well be on the point of entering a new phase. Synthetic resins promise to play an important part in aircraft construction during the next few years, although it would be idle to pretend that all the research and development work has been done. Much remains to be discovered still, not only in the way of the materials themselves but, perhaps, even more so in the matter of manufacturing technique.

Some idea of the results which have been obtained by one firm is provided by the article by Mr. Jablonsky in this issue. The particular process with which he deals is that evolved by the Heine firm in Germany, and in this country the resinised material has been given the name "Improved Wood," in our opinion a slightly ambiguous name, as it does not convey the idea of the fundamental principle of the Heine product, which is wood impregnated with synthetic resin and compressed at fairly high temperatures.

Staying Compressed

OBVIOUSLY, one can conceive many ways in which wood can be "improved." If a gatepost is coated with creosote it is "improved" as to its weathering qualities, but its mechanical characteristics are not appreciably affected. In the Heine product the resinous impregnation does something of the same sort, but it does much more in that it binds the wood in such a manner that when this leaves the press it retains the compressed dimensions instead of gradually expanding to within a little of its original size, as unimpregnated wood would do. Which rather reminds one of the visitor to a saw mill who was greatly intrigued by one of the planing machines. Watching the planks emerging from the two rollers which pulled them through the machine, he said, with the light of dawning understanding in his eyes: "Oh, I see, the planks are squeezed so hard between the rollers that they come out smooth!"

Graduated Strength

THE use of wood as an aircraft structural material has a number of advantages, provided the necessary supplies can be guaranteed. When the British Air Ministry decided some years ago that, after a certain period of grace, all aircraft intended for the R.A.F. must be made of metal, the reason was mainly that the supply of silver spruce was almost exhausted during the war 1914-18. It was not because of any idea at the time that metal was "better," purely as a material.

Apart from the waterproofing afforded by the synthetic resin—which reduces water absorption to something like 7 per cent.—the main advantages of the new process seem to be the homogeneity of the material and the way in which the strength can be varied from point to point in a long member. While keeping overall dimensions the same, a wing spar, for example, could be so reinforced by extra laminations that the strength was everywhere proportional to the load. In that way the most economic cantilever beam would be provided. With metal construction this can also be done by adding extra laminations at the root, but a considerable amount of riveting is usually required.

Where loads are fairly light, and more or less within the capacity of the natural wood, the low weight makes it possible to use sections thick enough to support the loads without the elaborate filigree reinforcement which is so often necessary to enable thin metal sections to support compression loads. Repeated a few hundred times in a given aircraft, this fact should make for simplicity.

Where the Seaplane Scores

AN incident occurred last week in the Solent which passed almost unnoticed; yet it is significant and may legitimately be used by flying-boat protagonists to back up their claims. *Capella*, on her homeward flight from India, encountered dense fog, and rather than run any risks by trying to find his base at Hythe, her captain alighted in the Solent and taxied up Southampton Water

Forthcoming Events

December 16. R.Ae.S. Students' Section Lecture: "Control Surface Design," by Mr. A. F. Walsh.
December 16. R.Ae.S. Coventry Branch: Papers by Members.
December 17. Eastbourne Flying Club: Dinner and Dance, Grand Hotel, Eastbourne.
December 17. London Aeroplane Club: Dinner and Dance, Park Lane Hotel, London.
December 19, Brooklands Flying Club: Arrival Competition at Shoreham.

1938.

January 5. R.U.S.I. Lecture: "The Training of a Royal Air Force Pilot," by Air Vice-Marshal L. A. Pattinson, Royal United Service Institution, 3 p.m.
January 11. R.Ae.S. Isle of Wight Branch Lecture: "Air Route and Aerodrome Control," by Capt. P. W. Lynch-Blosse.
January 13. R.Ae.S. Lecture*: "Radio as a Direct Aid to Landing Approach," by Sqn. Ldr. R. S. Blucke.
January 14. Strathtay Aero Club: Annual Ball.
January 18. R.Ae.S. Students' Section Lecture: "Turbulence and Skin Friction," by Mr. A. A. Hall.
January 19-21 (provisional). Aerodrome Owners' Association: Airports Exhibition, London.
January 20. R.Ae.S. Portsmouth Branch Lecture: "Aircraft of the Future," by A. Hessel Tiltman.
January 20. R.Ae.S. Coventry Branch Lecture: "Installation of Aero Engines," by Dr. G. P. Douglas.
January 25. R.Ae.S. Isle of Wight Branch Lecture: "Bird Flight," by Capt. J. Laurence Pritchard.
January 26. R.U.S.I. Lecture: "Imperial Air Routes," by Lieut.-Col. H. Burchall, Royal United Service Institution, 3 p.m.
January 28. Northamptonshire Aero Club: Annual Ball at Salon de Dance, Northampton.
February 9. York and Leeming Flying Club: Annual dance, Grand Hotel, Harrogate.
February 10. R.Ae.S. Portsmouth Branch Lecture: "Cowling and Cooling of Radial Engines," by Dr. G. P. Douglas.
February 17. R.Ae.S. Coventry Branch Lecture: "Aircraft Motive Power," by Major E. F. Green.

* All these lectures take place at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, beginning at 6.30 p.m.

KEEPING US ON THE MAP: The dearth of truly modern British commercial aircraft types is met to no unimportant extent by the introduction of the Percival Q4 and Q6 twin-engined monoplanes, described in this issue. Apart from being attractive propositions for the private owner the newcomers should be useful for charter and feeder work. This attractive view shows the prototype Q6 (Gipsy Six IIs), with fixed undercarriage, flying near Luton Aerodrome the other day. (*Flight* photograph)

to the temporary base. *Capella* took an hour and a half to do it, but she arrived safely and under her own power. A landplane in similar circumstances might have made a blind landing on the home aerodrome, or it might have been compelled to go and land elsewhere.

It may, of course, be argued, that if there was a delay of one and a half hours, it matters little whether that was spent by the passengers in reaching their destination by an alternative route or by taxying instead of flying the last few miles. One can, however, imagine conditions when it might matter quite a good deal. For instance, if friends or relatives are waiting at one aerodrome to receive arriving travellers, it is annoying, to say the least, for them to have to go back to London or, alternatively to rush off to an aerodrome in a different part of the country. Also, from the operating company's point of view, it is undesirable to have one of the machines fogbound at a distant aerodrome, where there may be delays in inspecting and overhauling it for its next trip

French Army Co-operation

THE French Air Minister, M. Cot, in the debate on the Air Estimates in the Chamber of Deputies, said that the creation of an air arm for the artillery was under consideration. If it were formed, the observers would be officers of the Army.

This suggestion shows the difference between French practice and our own in a matter of important detail. The French method is the one used by all the belligerents (including ourselves) during the Great War; the crew of an army co-operation machine consisted of a pilot and an observer-gunner. It was the latter who observed the fall of the shells and sent wireless corrections to the battery. Our Royal Air Force has now radically altered that system, and the crew consists of a pilot-observer and a gunner.

The reason for the British arrangement is that the actual piloting of an aeroplane engaged on reconnaissance is so automatic that it makes no demand on the energies of the pilot. He is able to give his full attention to observing, whether spotting for the guns or general reconnaissance, and he sends the wireless messages, makes notes, and, if necessary, takes photographs. But it is considered quite essential that his attention must not be distracted by thoughts of attack from behind. Therefore, the man in the back seat is a gunner, pure and simple, whose whole job is to keep a look-out to the rear. Not until the rear gun opens fire does the pilot need to turn his thoughts from observation to air combat.

Some Problems

M. COT is reported to have said that the observers in the artillery aeroplanes would be officers of the Army. This would seem on a par with the system which has prevailed for some years past in our Fleet Air Arm, whereby all the observers were naval officers. Actually, British experience has gone to show that for Army work it does not much matter to which Service the pilot-observer belongs provided that he is very thoroughly trained in his task. The course of training at the School of Army Co-operation at Old Sarum is very thorough indeed, and the pilots (a few of whom are seconded from the Army, but most of whom belong to the R.A.F.) become experts at their task.

The only weak points in the British system are (a) that the R.A.F. officers who have become specialists at army co-operation are liable to be transferred to other classes of squadrons, and (b) that a certain amount of dual responsibility and divided allegiance are inevitable. The Army authorities can neither directly reward good work nor punish bad work done for the Army.

In the French system, as suggested by M. Cot, the difficulty will arise of having two officers from different Services working in the same machine. If the two do not work in complete harmony, awkward questions of seniority and authority may provide problems not easy of solution.

THE PERCIVAL "TWINS"

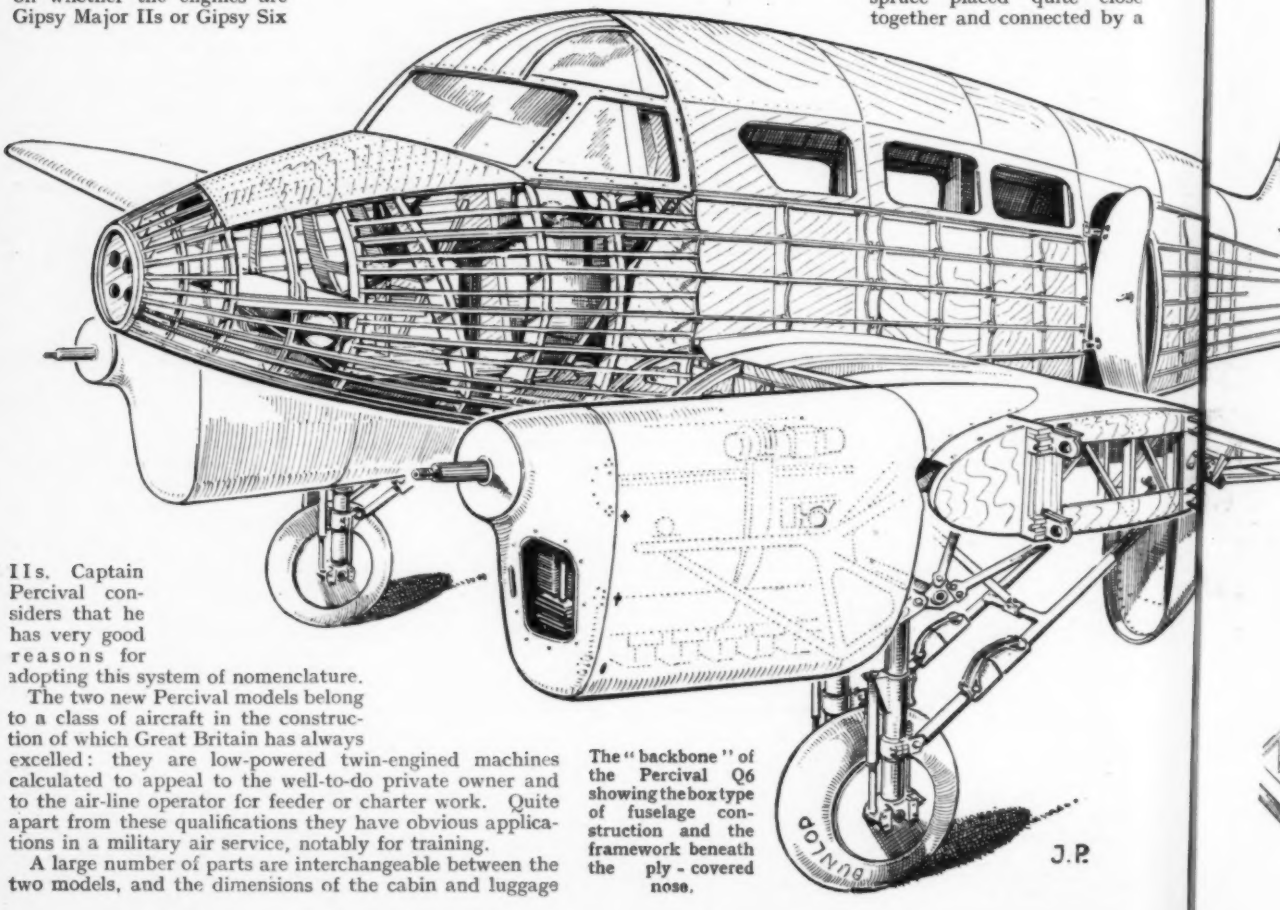
The Q4 and Q6 Monoplanes : Choice of Engine and Undercarriage Installations : Cruising at 185 m.p.h. with Two Gipsy Six IIs

THE elegance which has always been associated with the Percival monoplanes is well preserved, and even enhanced, in two recently announced additions to the range. But whereas our ears have hitherto been regaled with delightful names of ornithological derivation, the newcomers will be known as the Q4 and Q6, depending on whether the engines are Gipsy Major IIs or Gipsy Six IIs. Captain Percival considers that he has very good reasons for adopting this system of nomenclature.

The two new Percival models belong to a class of aircraft in the construction of which Great Britain has always excelled: they are low-powered twin-engined machines calculated to appeal to the well-to-do private owner and to the air-line operator for feeder or charter work. Quite apart from these qualifications they have obvious applications in a military air service, notably for training.

A large number of parts are interchangeable between the two models, and the dimensions of the cabin and luggage compartment are the same in each case. The span of the Q6 is, however, 2ft. 8in. greater than that of the smaller machine.

In principle the wing construction follows standard Percival practice. There are two closely spaced box spars with plywood webs, spruce flanges and stiffeners of spruce placed quite close together and connected by a



The "backbone" of the Percival Q6 showing the box type of fuselage construction and the framework beneath the ply-covered nose.

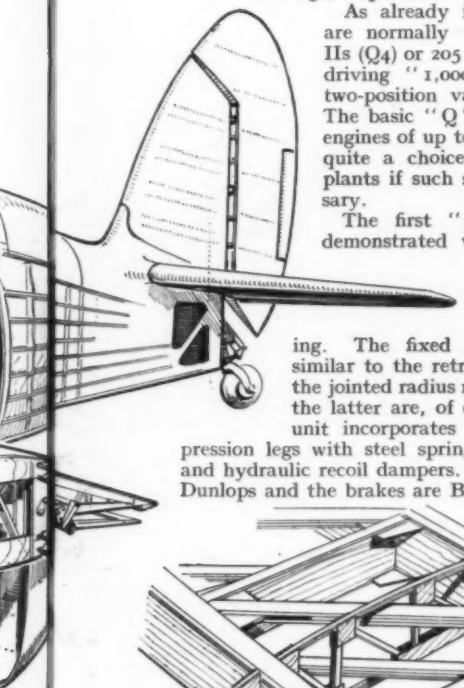
system of rigid bracing members (taking torsional and drag loads) in the planes of the top and bottom flanges, attachment being by plywood gusset plates. The cross-bracing members are parallel, whereas in previous Percival machines the upper and lower members in each bay were arranged in lattice formation. The rib structure, with diaphragms, is seen to advantage in the accompanying sketch. Except for one small section inboard of each aileron the wing is plywood covered, for the greater part, with 3 mm. ply, although that over the nose section is 2 mm. Suitable stiffening is provided for the leading edge on the inner bays. The internal structure is carefully protected against deterioration before covering. The ailerons are of high aspect ratio and are of similar construction to those of the Vega Gull.

As the wing is built in three separate sections (centre section, with spars running through the fuselage, and two outer panels) it is a comparatively simple matter to arrange for the wings to fold, although the standard versions of the Q4 and Q6 are not so equipped. The wing fittings are of stainless steel.

The split trailing edge flaps are in four sections, and are vacuum-operated by the Theed system from a switch in the cockpit.

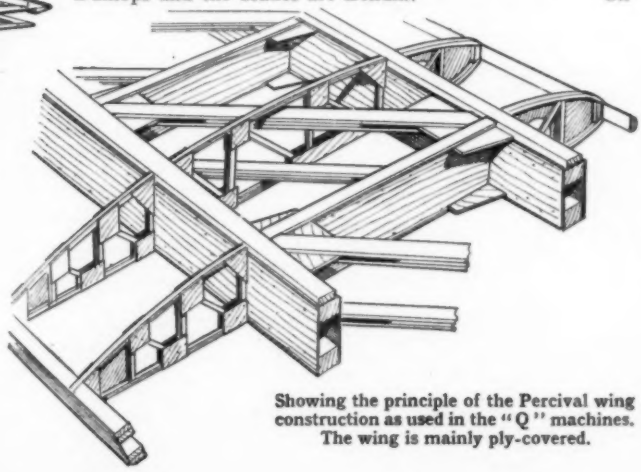
Four fuel tanks—all of approximately 20 gallons capacity—are housed in the wing, two being in the centre section and the other pair in the outer panels. If required, additional tankage for 10-15 gallons could be housed outboard. The oil tanks are behind the engines.

Installed in a machine like the "Q," the inverted air-cooled de Havilland engines are particularly happy. The thrust line falls conveniently in relation to the wing, and the tail fairing behind the inverted cylinders is ideally suited for housing the retractable undercarriage, if specified.

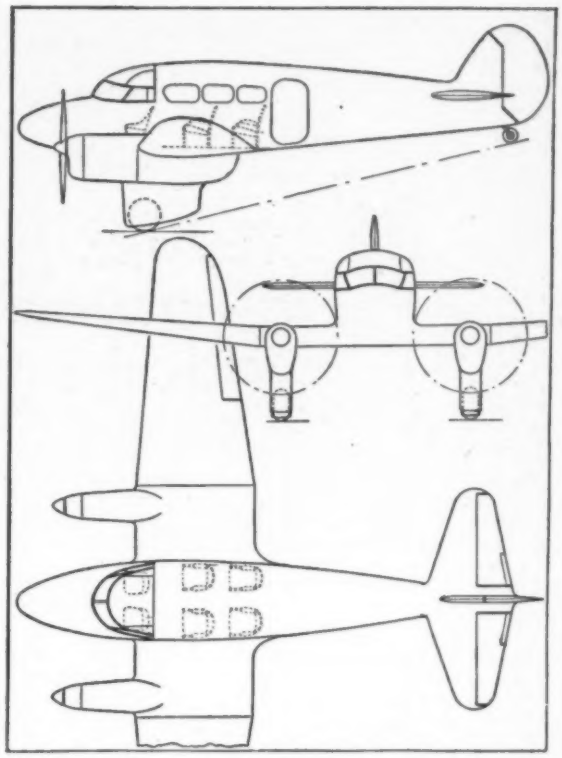


As already intimated, the engines are normally 140 h.p. Gipsy Major IIs (Q4) or 205 h.p. Gipsy Six IIs (Q6) driving "1,000" size de Havilland two-position variable-pitch airscrews. The basic "Q" design is stressed for engines of up to 300 h.p., which gives quite a choice of alternative power plants if such should really be necessary.

The first "Q" machine will be demonstrated with the fixed undercarriage, which has trouser-type fairings merging smoothly into the engine cowling. The fixed version is essentially similar to the retractable gear, although the jointed radius rods which characterise the latter are, of course, deleted. Each unit incorporates two long-travel compression legs with steel springs taking compression and hydraulic recoil dampers. Wheels and tyres are Dunlops and the brakes are Bendix.



Showing the principle of the Percival wing construction as used in the "Q" machines. The wing is mainly ply-covered.



Basically, the shapely fuselage is a plywood box with stringers and formers carrying the fabric fairing. The nose section, forward of the front spar, has plywood covering over an arrangement of formers and stringers. The grain of the nose sheeting is set at 45 degrees to prevent buckling. There is cross-bracing in the rear section of the fuselage, though the cabin itself is unrestricted except for the spars which cross the floor but are very little hindrance. Detachable panels under the nose facilitate inspection. The nose, incidentally, houses the air intake.

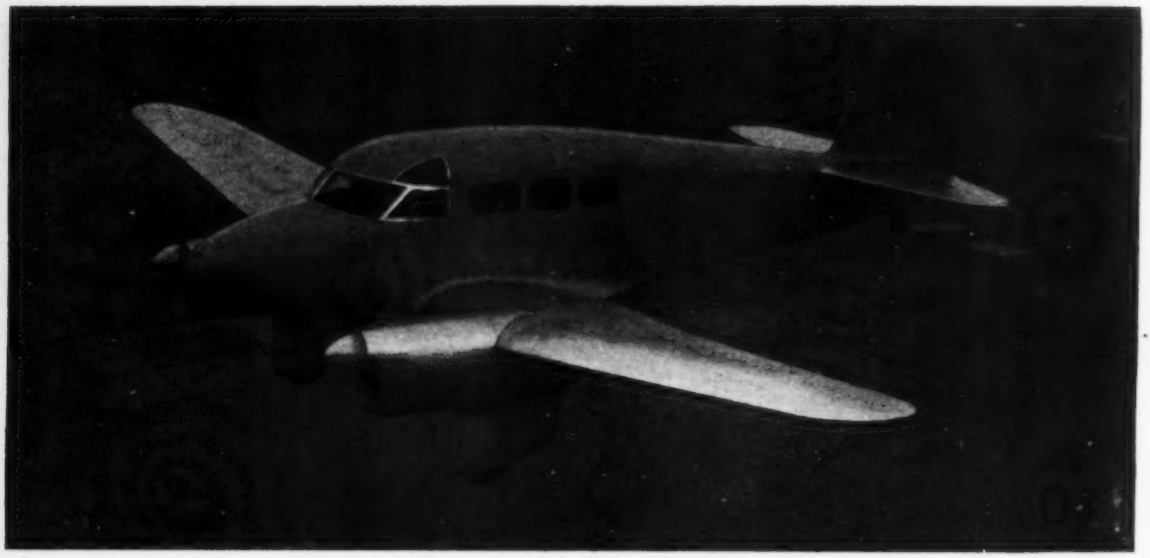
Of typical Percival design, the tail has a cantilever fin and tailplane, and rudder and elevator incorporating trimming tabs.

The pilots' compartment ends at the front spar and will accommodate two side by side. A quite exceptionally neat windscreen of Plastilume-moulded Rhodoid is fitted and, apart from being aerodynamically efficient, conveniently sheds rain.

Swing-over controls are used in conjunction with two sets of rudder pedals. The prototype has the majority of the instruments grouped on the port side, the opposite panel bearing the air temperature and fuel gauges. On the extreme port side are grouped duplicated A.S.I.s, tachometers and boost gauges (the latter are necessary to measure the "depression" in the induction systems of the D.H. engines), and then come the Sperry panel, starter buttons, pitch controls, air intake controls and flap switch. The comfort of the pilot has been well considered, and there is no lack of such items as map pockets. View, as will be gathered from the G.A. drawings, is well up to standard for this type of aircraft.

The cabin has been treated by Rumbold; that is sufficient indication of the standard of finish and comfort. There are four chairs and, at the rear end on the starboard side, a fine luggage locker, measuring 20in. by 39in. by 26in., and holding 200 lb. Access is through a door on the port side at the rear of the cabin. Dimensions of the cabin are: width, 4ft. 4in., average height 5ft. 2in., length 9ft. 2in. A bulkhead or heavy curtain between the cabin and the cockpit is optional.

Provisional prices are: Q4, with fixed undercarriage, £3,975; Q6, with fixed undercarriage,



Despite the comparative roominess of the cabin the new Percival is of attractive external form. The efficient windscreen shape is discernible here. (*Flight* photograph.)

£4,350. The following are included as standard: Landing light, navigation lights and instrument lights, bonding for radio, electric starters, electric generator, artificial horizon, direction gyro and normal engine and flying instruments. Wings and tail surfaces will normally be finished in silver, with the fuselage any one colour.

Orders have already been received for a number of "Qs," and delivery has been promised for January. Work has started on a batch of ten; when those have been despatched another dozen will be put down. The prototype has done about 20 hours' flying and will soon be off to Martlesham.

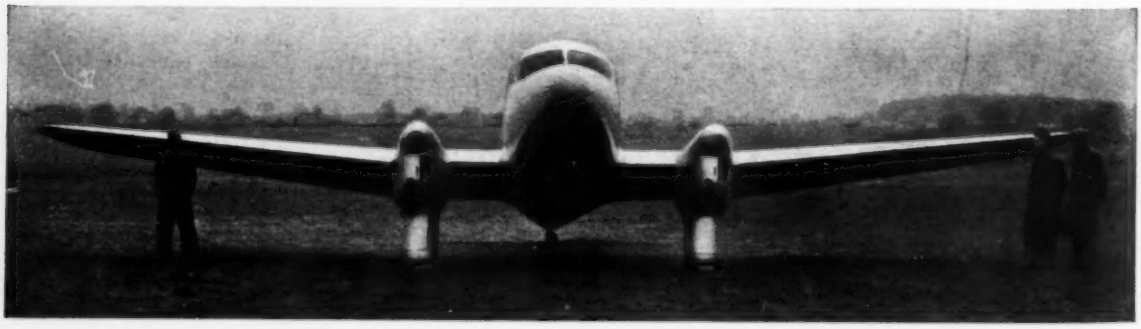
According to Captain Percival, the "Q" reproduces many of the familiar and popular Percival characteristics. The approach is quite steep, and the take-off run of the Q6 with full load in no wind is, on an average, 200 yd. The machine will fly, with the help of the trimming tabs, hands and feet off with one engine out of action.

The cabin gives a delightful sense of roominess, and the decibel reading must be very low.

PERCIVAL Q4 and Q6
Light Twin-Engined Cabin Monoplanes

	Q4	Q6
Engines	Gipsy Major II	Gipsy Six II
DIMENSIONS		
Span	44ft.	46ft. 8in.
Length	32ft. 3in.	32ft. 3in.
Height	9ft. 9in.	9ft. 9in.
Wing area	260 sq. ft.	278 sq. ft.
WEIGHTS		
Tare weight	2,740lb.	3,200lb.
Gross weight	4,525lb.	5,100lb.
PERFORMANCE		
Top speed (sea level)	170 m.p.h.	195 m.p.h.
Cruising speed (7,000ft.)	165 m.p.h.	186 m.p.h.
Landing speed (with flaps)	44 m.p.h.	56 m.p.h.
Service ceiling	20,000ft.	21,000ft.
Ceiling on one engine	5,000ft.	6,500ft.
Range at cruising speed	660 miles	750 miles

Captain Edgar Percival at the controls of the prototype Q6. It will be gathered that there has been no stinting of elbow room in the cockpit, nor, for that matter, in the cabin. (*Flight* photograph)



Quite delightfully clean, even with a fixed undercarriage, the Q6 with retractable wheels will be uncommonly attractive. (*Flight* photograph.)

THE STEEL DINNER

Sheffield A.I.D. Inspectors and the Industry

THE Sheffield steel companies can claim a share in every recent British aeronautical achievement and advance; yet Sheffield seldom receives the credit that is due. At the A.I.D.-Approved Inspectors' annual dinner, held in the Steel City on Wednesday of last week, the Director of Aeronautical Inspection, Lt.-Col. H. W. S. Outram, proposed the toast of The Inspectors. He spoke of the difficulties brought about by the expansion, and said that the crest had not yet been reached; he was satisfied, however, that the approved inspectors were quite able to deal with the increased production. Last year's work had proved that the system of approved inspection was essential to deal with the rapid expansion. He took the opportunity of thanking the inspectors for the part they had played.

Col. Outram was very pleased to see the Director of Technical Development, Air Commodore R. H. Verney, at the dinner, and thought of him, not in his present rank, but as inspector of engines in Sheffield during the War.

The name of the Master Cutler was coupled with Col. Outram's toast, and, in an excellent speech acknowledging the toast, the holder of that office, Col. F. A. Neill, said that the Air Ministry would be the first to admit that without the discoveries made by our metallurgists and the research and experimental work carried out in Sheffield on alloy steels and other materials, the speed records in the air, on land, and in water, and the remarkable efficiency of our aircraft would not have been possible. Sheffield, he said, was responsible in the eighteenth century for the crucible process of steel melting, which method of refinement brought about the advent of alloy steels, with their qualities of less bulk and lighter weight, and later on she led the world in the production of modern high-speed steel and stainless steel. It was safe to say, also, that Sheffield had to-day, in high-frequency melting plants, the finest equipment in the world.

Col. Neill continued: "You may be assured that Sheffield places her entire and unparalleled resources not only in this time of stress following the R.A.F. expansion, but at all times, at your disposal, and with the amount of research work being carried on in the private laboratories not only in our great steel works but in many other analogous trades, I am confident we shall continue in the future, as in the past, to lead the world in the development of alloy steels and the many products and engineers' tools made from them.

"The Approved Inspectors will continue to co-operate wholeheartedly with the Aeronautical Inspection Directorate in their work of making our Air Force, both from a quantity and quality point of view, incomparable."

The Master Cutler said that his own firm had only recently come into the "approved scheme." There was laugher when he added that, although their two approved inspectors were unable to keep themselves warm with the small amount of work they were called upon to inspect, any lack of opportunity on their part was more than made up by the amount of clerical work involved in the appointment.

He said that the increased volume of work which Sheffield and district was doing to meet the urgent necessity for an increased Air Force was shown by the fact that before the expansion started the A.I.D. staff was six, and was now about thirty-six.

Then—and Now

Dr. W. H. Hatfield proposed "The A.I.D.," whom he regarded as great friends of the scientific fraternity. He said that Sheffield lived on quality, and the department was driving the city to produce that which was almost perfect. During the War the life of an aero engine was about 40 hours. To-day an engine did not receive its first overhaul until it had done 500 hours. The weight of an engine had dropped from 2½ lb./h.p. to 1 lb. He congratulated the Air Ministry on a great achievement.

The Inspector in charge of the Sheffield A.I.D., Mr. C. Wilkinson, said the attendance at this dinner was a record. At the earlier functions the participants had been "all steel," but, as in steel, the non-metallic inclusions seemed to have increased—they were, however, very welcome. He talked of exacting specifications and the clause which required inspectors to sign that a sample had "no defects." He believed that there was only one Nelson, but that there must be others with a blind eye to the microscope. He was sorry that Sheffield was well off the air map, although it was the foundation-stone of the aircraft industry. An aeroplane might be constructed using only steels, but, with deference to Dr. Aitchison (well known as an expert on light alloys), he did not think an aeroplane using alloy and no steel was possible. Mr. Wilkinson had seen in a shadow factory a notice: "A hidden mistake may cost a brave man's life." He believed "one life" to be an underestimation, and suggested, instead, "an undiscovered fault may cost many lives."

SOME IDEAS on the GIFT PROBLEM

CHRISTMAS gifts with an aeronautical flavour—something to appeal to friends and relatives who are flying club members or Service pilots—do not come readily to the mind of those "outside the game." Yet it is really surprising what a wide choice of practical presents is actually available.

Clothing and "personal comfort" items, for instance—such things as goggles, gloves, helmets and cushions; the prospective purchaser will find a selection at all prices offered by such specialists as D. Lewis, Ltd., 124, Great Portland Street, London, W.1; S. Lewis's, 27, Carburton Street, London, S.W.1; Moss Bros. and Co., Ltd., Covent Garden, London, W.C.2; E. B. Meyrowitz, Ltd., 1a, Old Bond Street, London, W.1; Burberry, Ltd., Haymarket, London, S.W.1; and Gieves, Ltd., of 21, Old Bond Street, London, W.1. Moseley "Float-on-Air" cushions can guarantee flying comfort. In a rather different category, and appealing also to those who work in engine and aircraft factories, is the Mallock-Armstrong Ear Defender (39, Victoria Street, London, S.W.1).

Course and distance calculators, and other such useful navigational "gadgets," are provided by such firms as Smith's Aircraft Instruments, Cricklewood, London, N.W.2; Simmonds Aerocessories, Ltd., Great West Road, Brentford; and (ex-R.A.F. types), L. Lipton, 614, Old Ford Road, London, E.3.

Many of the foregoing items, incidentally, are handled by agents such as Airco, Ltd., 3, St. James's Square, London, S.W.1.

Presentation scale-model aircraft are a speciality of The Goldsmiths and Silversmiths Co., Ltd., 112, Regent Street, London, W.1, who also offer among their jewellery items with the R.A.F. badge—as do Gieve's, already mentioned.

Books are always acceptable, and Sir Isaac Pitman and Sons, Ltd., publish an immense range of volumes on aeronautical subjects, as do (though usually in a more highly technical field) the McGraw Hill Publishing Co.; and the Technical Press, Ltd. (5, Ave Maria Lane, London, E.C.4). A standard work on navigation, *Martin's Air Navigation*, is published by the Eversley Press, Ltd. (33 and 34, Craven Street, London, W.C.2).

For younger enthusiasts there are model aircraft, among makers of kits, complete models and parts, may be mentioned Premier Aeromodel Supplies, 2a, Hornsey Rise, London, N.19; Kanga Aero Models, 1, Colonade Passage, Birmingham; Model Aircraft Stores, Bournemouth and (in this case heavy paperweight-type miniature scale models) Seacrafts, 65b, Golders Green Road, London, N.W.11.

Finally, for the smoker, no donor can go far wrong with one of Player's or Wills' presentation boxes of cigarettes or tobacco.

Cork and the Carburettor

CORK, prepared in various forms for a large number of purposes, is a speciality of Walter Mays, Ltd., Abbey Cork Mills, Merton, Surrey.

One particular item which they manufacture in large quantities is the cork float for carburettors, and they state that floats of their manufacture have figured in practically every record-breaking machine, including the Bristol monoplane, which secured the altitude record. The outstanding advantage of the cork float, of course, is the fact that no failure can result from a puncture. It is used, for aircraft work, protected with a dozen coats of petrol-resisting dope.

Another "line" of Walter Mays, Ltd., is the manufacture of "strut-sealing" corks for naval and other aircraft used over water. By the watertight plugging of tubular members additional buoyancy is secured.

Fairey Dividend

AT a board meeting of the Fairey Aviation Co., Ltd., held last Friday, it was decided to recommend a dividend of 12½ per cent., free of income tax, in respect of the year ended September 30, 1937, and payable on January 10 next.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The Names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

OVERLOOKING THE OPERATOR?

IMPERIAL Airways are declaredly striving for maximum efficiency of their flying personnel, and to that end giving their First Officers free training for their wireless, navigating and engineering licences.

Wireless operators seem to have been overlooked in this search for efficiency for, strangely enough, they are not afforded similar facilities for study. This, I feel, is a grave mistake in policy on the part of Imperial Airways, for wireless operators, already a vital part of the aircraft's crew, would be of infinitely more value to their employers were they also to hold these additional licences.

Furthermore, it is only natural that these men, unless they are granted similar facilities for study, advancement and increased efficiency, will eventually feel that they are being discriminated against, and no company, least of all one always in the public eye like Imperial Airways, can afford to have discontent among its employees.

NORMAN VAUGHAN, A.I.W.T.,
(Late Assistant Marconi Instructor,
Croydon. Imperial Airways School).

THAT CIVIL AVIATION DEBATE

AS a manufacturer of civil aircraft I welcomed, and was privileged to listen to the latter part of, the debate on civil aviation which took place in the House of Commons on November 17, because it was obvious to all that the House was deeply interested in the future of British civil aviation and distressed at the position disclosed.

Much of the debate was upon matters on which I am not competent to express an opinion, but that part dealing with the alleged failure of the British aircraft industry to meet foreign competition both at home and in world markets is within my knowledge.

Mr. Perkins, in his speech, repeated a statement which has been made so often that it is in danger of becoming accepted as a fact if not refuted. He said: "... after years of neglect there is no civil airliner of a size suitable to sell in the Empire or in Europe. British Airways, the chosen instrument of the Government, a short time ago desired to buy more aeroplanes. They searched this country and could not find a suitable aeroplane, and as a result they bought German and American aeroplanes." (Hansard.)

In certain circumstances this might have been substantially correct, but in point of fact, British Airways bought a type with a specification almost exactly the same as that of the latest British type which had been developed.

In 1935 my company produced the Monospar Croydon, a ten-passenger, twin-engine, low-wing monoplane, cruising at 193 m.p.h. and in every way comparable in capacity and performance with the American machines referred to by Mr. Perkins and, we claim, in advance of them in comfort and safety.

This machine was designed, built and flown in under eleven months, entirely as a private venture to meet just such a demand and emergency as had arisen.

After almost a year's development and demonstration flying, as proof of its readiness for air service in all latitudes, we had the prototype flown out to Australia, carrying full load the whole way, and during the greater part of the journey our chief designer, Mr. Crocombe, was on board so that he might observe its operation in the various climates and conditions through which it passed. I believe I am right in saying that the machine still holds the record for the fastest journey from south to north across the Australian continent.

We must confess that, although fully satisfied with the machine, we had not rushed into production because of the general apathy at that time among operators to the importance of the type.

This machine was offered to British Airways to meet an emergency with which they were faced, but the delivery date we could guarantee was four months later than that quoted by our American competitors, who were already in full production. British Airways advised us that under the terms of an agreement they held with the Air Ministry, they were bound to start a service before that extra four months had elapsed. We pleaded with British Airways and with the Air Ministry that as our delivery was the minimum that any British firm could give (we had already proved our competence), the right course to pursue would be to modify the agreement so that the additional four months could be provided. But we were assured that they saw no possibility of this being done.

We pointed out that the introduction of American aircraft into this country under these circumstances would deal a very heavy blow at the British aircraft industry. History and the debate show clearly that our fears were well grounded.

More recently, in trying to make a further constructive contribution to the problem, we lodged with the Director-General of Civil Aviation a memorandum which set out fully what many important people have been generous enough to say was a really practical plan for dealing with the situation.

It is encouraging to note that the Under-Secretary of State for Air, in his reply to the debate, said: "The hon. and gallant Member for Barkston Ash said that he thought the Government might do a great deal more in the production of prototypes. . . . In point of fact, the Government have taken steps recently to press on with this sort of question. We have had meetings with the civil air companies at which we have tried to thrash out what is so essential, namely, a common specification, or common specifications, for certain types of aircraft for civil work which will meet the needs of civil companies operating in this country and abroad. The Air Ministry has been in consultation with the civil companies on that matter." (Hansard.)

There is, therefore, reason to hope that it will not be long before some practical steps of co-operation between the Air Ministry and the aircraft constructors will be taken.

E. C. GORDON ENGLAND.

[Owing to pressure on space in our recent special numbers, this letter from Mr. E. C. Gordon England has unavoidably been held over until now.—ED.]

LAST BUT NOT LEAST

NOT having been included in your list in a recent issue, may I in a meek little voice also claim some connection with the now world-famous racing car *Thunderbolt*?

My company was responsible for the design and construction of the aerodynamic fin attached to the rear of the car. The actual value of such a fin in maintaining the car on a true course at 312 m.p.h. must be colossal.

In designing the fin a maximum yaw of 25 degrees was allowed. At a speed of 300 m.p.h. the load on the fin would then be equivalent to 2 tons, and the actual fin is designed to withstand a load of 4 tons.

I have not witnessed a car travelling at such a speed, but dare not even imagine what the results would be should the angle of 25 degrees be attained in a yaw or skid.

To the layman the fin is just an "aeroplane gadget on the rear of the car," but, as I have just pointed out, forethought and attention have to be given even to such a small item as this.

When I think of the complete design of *Thunderbolt*, and the organisation necessary for the achieving of success in such a venture, I certainly congratulate, and take my hat off to, Captain George Eyston.

G. N. WICKNER,
Foster, Wickner Aircraft Co., Ltd.
Southampton Airport.

No More Misting

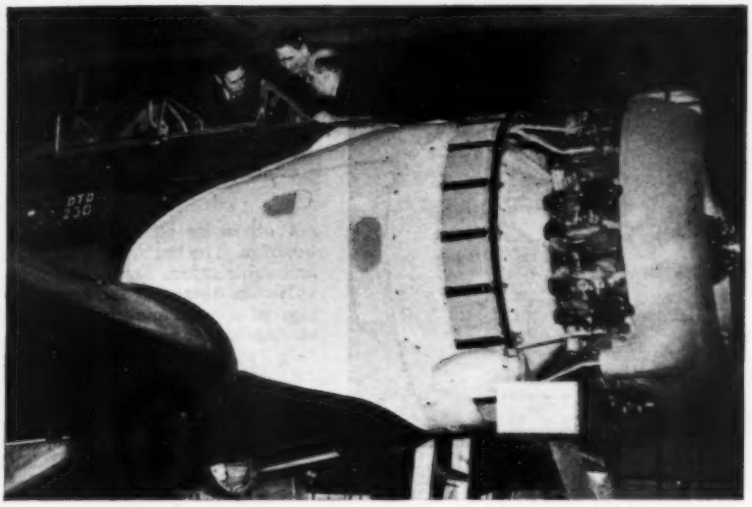
THE problem of internally misted windscreens and windows in cars, aircraft, etc., has been attacked from a new angle by the makers of "Duravista." This is described as "glass skin," and consists of a thin film of transparent material having a glycerine base.

Tests made by *Flight* on windscreens and shaving mirrors have shown that the claim that steaming-up is impossible is justified. The method of application is not difficult, though unless care is taken, small flaws may be left in the surface due to the fact that air bubbles have not been smoothed away. The "Duravista" surface is seen to be very slightly duller than a mirror on which it is fixed, but in the case of application to a windscreen vision is in no way impaired.

Cleaning must only be carried out by washing with a special fabric and cold water. Thus, to safeguard the surface from normal cleaning methods, which would tend to scratch it, the wise user would warn any other person who would be likely to clean it. A single application should last for a year or more. "Duravista" is supplied, at 10s. 6d. per packet of five sheets measuring 15¾in. x 9¾in., by Western Products Co., Ltd., 198, Buchanan Street, Glasgow, C.1.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS



THE LONG-RANGE WELLESLEY: H.M. the King, during his tour of aircraft factories last week, was shown the long-range Wellesley in the Vickers works. It will be seen that the nose of the machine has been modified as compared with that of the standard Wellesley. A close-up view of the group appears on page 604c.

AN air-raid shelter in the form of a steel tunnel, eight to nine feet high, is being built near Caxton Hall, Westminster.

The underground passages and chambers of Windsor Castle are being converted into bomb-proof and gas-proof shelters.

Lord Sempill recently opened an aeronautical engineering workshop at Taunton School, Somerset. The Air Ministry has presented a Bristol Bulldog as an object for dissection.

All who are interested in the brilliant achievements of British motor cycles and riders in international races and trials will find the stories of the past year's events vividly reviewed in to-day's special British Achievements Number of our associated journal, *The Motor Cycle*.

The Hanriot H-220 twin-engined fighter exhibited at the last Paris Show is likely to be used for an attack on some world's records. The machine is now fitted with a pair of the small-diameter Gnome-Rhone M.14s of 650 h.p.

It has been intimated by the Air Ministry that a "private use" licence has been issued for a new civil aerodrome at Barton, Bedfordshire.

The Air Ministry announces the appointment of Group Captain C. G. Pirie, M.C., D.F.C., to the special duty list on appointment as Air Attaché, Washington, to date October 18 last.

Fourteen Consolidated patrol bombers of the U.S. Navy, carrying 98 officers and men, have flown in formation nonstop from San Diego, California, to the Panama Canal in 21½ hours.

A model flying boat, weighing 1,860 lb., and having a span of 43½ft., has been built by the Martin company. It has two airscrews driven by belts from a single engine and is providing some useful aerodynamic and hydrodynamic data.

French dive bombers, notably the cranked-wing Nieuport which has been converted into a single-seater, are being fitted with reversible-pitch airscrews to keep down the speed for dive-bombing purposes.

During the second Parsons Memorial Lecture, recently given at the Institution of Electrical Engineers, Dr. Gerald Stoney chose for his subject some of the less well-known activities of the late Sir Charles Parsons, the pioneer of the modern steam turbine.

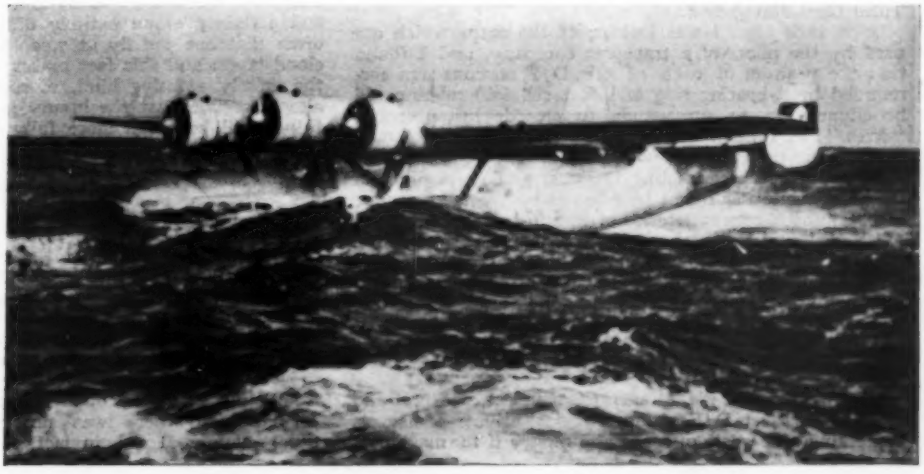
The speaker mentioned that in 1893 Sir Charles devised a steam engine developing ¼ h.p. at 1,200 r.p.m., having its cylinder inside a boiler to prevent condensation, and used it to propel a model monoplane about 80 yards at a height of 20ft. in the air.

The Noel Davis Trophy, awarded annually to the most efficient flying unit of the U.S. Naval Reserve, has been awarded, for the second consecutive year, to the First Aviation Division Squadron VS-12R, popularly known as the Navy T.W.A. Squadron because all its officers are pilots of Trans-Continental and Western Air and 60 per cent. of the enlisted men are employees of the same air line.

Twenty-five Years Ago

(From "Flight," December 14, 1912.)

"We are anxious to obtain further information relating to the actual experiences of those pilots who have been so unfortunate as temporarily to lose control in mid-air, and the Editor would esteem it a favour if they would communicate with him on the subject. Particulars thus obtained will not be published without permission, but we are very anxious to collect as much reliable data as possible at first hand, and anyone who can contribute a personal experience of an abnormal character in mid-air will serve a really useful purpose."



SHIPPING IT GREEN: The latest Dornier naval flying boat as supplied to the German and the Dutch Governments during rough weather trials in the North Sea. This boat is said to have a very fine performance (top speed 212 m.p.h.) and as supplied to Holland will have Pegasus or Cyclone engines.

THE REAL THING: Not long ago one of the new Jacobs-engined Beechcraft 18s was flown from New York to Philadelphia and back at an average speed of 125 m.p.h. on one engine with a normal load. Immediately after the take-off the port engine was switched off and a brake used to stop the airscrew. The machine climbed to 4,000ft. for the trip. This photograph was taken as the machine was flying over New York.

Topics of the Day

Radio Again

WHENEVER the subject of radio assistance for the private owner crops up, as it often does in more serious discussions between amateur pilots, the tendency is to concentrate rather on its possible assistance than its amusement value.

There is no doubt that some form of direction-finding and homing equipment, provided that this is sufficiently inexpensive and light in weight, would be of real value to the owner in his travels, particularly when these are made on the Continent, where broadcasting stations always appear to be next door to aerodromes. However, as a typical amateur, the attraction of such equipment to me would be its capacity for providing me with something to do on fairly long-distance cross-countries. I am much too nervous a pilot to think of setting off on any journey in the sort of conditions where progress in the correct direction is only possible with radio assistance (though there are always times, of course, when the sky suddenly muddles itself up with the earth and a nice piece of D/F would be really very comforting), but, like a number of other earnest searchers after knowledge, I am always ready to use any device which provides a pilot with a chance of playing at Third Class Navigation.

Some time ago I was looking at the maps which are used by the pilots of a transport company, and I found that the position of each of the D/F stations was surrounded by a bearing ring and that celluloid rulers could be clipped on to press-studs to provide instantaneous "fixes." If I habitually used D/F equipment I should have all my maps rebuilt with press-studs at the positions of the different broadcasting stations, and the tedium of long cross-countries might be relieved by the mere process of obtaining a constant series of positions. The fact that my actual position might be known to me perfectly well from plain map-reading is neither here nor there, and there are times when, after a period of novel-reading or map examination in good weather, it is quite difficult to recognise the particular spot over which one is passing.

Co-ordinated Equipment

THE whole point is that even the simplest, cheapest and most perfect D/F equipment for private owners is something of a waste of space and money if the machine is not otherwise equipped to make use of it. The business of addition and subtraction, for instance, involved in obtaining the true bearings of a particular broadcasting station may occupy, without the help of a special calculating machine, so much time that the bearing is almost useless when it is finally obtained; furthermore, it is very difficult indeed to draw straight lines on the ordinary kind of map while one is in the air.

Obviously, the owner of such radio equipment would need to have, say, special ten-mile maps mounted on boards with compass roses at each radio station and with some means for laying off bearings quickly and accurately. He would need to devise, too, some simple calculating machine for sorting out the D/F bearings obtained from the magnetic headings of his machine—though experienced transport pilots seem to have an uncanny capacity for making the necessary calculations in their heads. Success in this mental arithmetic is largely a matter of visualising the direction in which one is flying with the approximate position of the radio station in relation to this direction.

There are all kinds of simple little systems to be developed for making the best use of any form of navigational equipment. One can work, for instance, rather as the highbrow celestial navigators do, on a series of pre-computed bearings and positions. In other words, when you have reached such-and-such a place the bearing of a certain broadcasting station should be a particular figure. If it is not then your initial ground speed calculation is not correct and must be amended accordingly.

These modern "light" aeroplanes with engines designed to give the best results at quite considerable altitudes provide new problems, since the wind speed on which courses are initially calculated is that in effect at 2,000 feet; at 7,000 feet it may be blowing in a totally different direction and certainly at an entirely different speed. It is not often that one can fly at 7,000 feet and not be above a cloud layer, and this fact makes radio assistance, even of the merely amusing kind, of some definite value. It is almost certain that the luxury private-owner type of the future will be much more fully equipped than anything yet seen.

Overweather

INCIDENTALLY, a few days ago I found another good reason for thinking that the more equipment one has the better and that every light aeroplane should at least be fitted with some form of gyroscopic instrument for use in emergency.

On this occasion I was forced by sheer curiosity to climb up through a series of broken cloud layers at different altitudes in order to view some really magnificent snow clouds from peak level—which, in this case, was 9,000 feet. As it happened there was no need to do any blind flying, though, I did, in fact, take short cuts through a

number of large cloud masses on my way up to the top of the world.

Nevertheless, the climb would never have been attempted if the machine had not been fitted with a turn indicator, for the simple reason that "one never knows." The broken layers might have closed up and there might even have been snowfalls in the intermediate areas, since the meteorological office had predicted ice-forming conditions between 3,000 and 7,000 feet. Below the first level any snow would become rain and above the second it would, presumably, be too cold for either precipitation or ice-formation. While passing through one cloud, at about 5,000 feet, the machine did, in fact, collect a very small quantity of ice and the airspeed indicator might possibly have gone out of action. However, there was a fore and aft level on which to fall back.

Anyway, the trip provided a visual experience of a kind which I have never previously enjoyed even during substratospheric passages in transport aeroplanes. Let equipment be unconfined. INDICATOR.

FROM the CLUBS and SCHOOLS

HAMPSHIRE

THE Christmas Party is to take place on Saturday next, December 18. Members have been specialising in night flying and 3½ hours were put in last week by Messrs. P. J. Grenside and J. F. Laurie-Dickson. During this period the flying total was 51 hr. 15 min. Lieut. Hopkins, R.N., made his first solo.

LONDON

The flying time for last week was 20 hr. 50 min., and among the new members was Mr. I. Barkhuysen.

YAPTON

Rain, sleet and snow have badly handicapped flying for the week ended December 11 and only 17 hr. 35 min. was spent in the air. Messrs. H. B. Devereux and J. D. Hayman have joined the club.

READING

The reorganised club is now established in its new premises at the Falcon Hotel and a subsidy has been obtained. Three new flying members—Messrs. Bail, Townsend and Botting—have joined.

STRATHTAY

Fogs and snowstorms at Scone seriously restricted flying during the week ended December 5. There will be no Club flying over Christmas week-end, but the usual facilities will be available for that following.

C.A.S.C.

Last week-end at Cambridge members flew 5 hr. 45 min., including blind-flying instruction by three members. Mr. C. Pope made his first flight with the Corps Four more members have passed the ground-instruction test.

HANWORTH

A new member is Mr. Lloyd-Smith, of Australia, who is on a visit to England. He holds an Australian "A" licence. Mr. Jim Broadbent hired the club Leopard Moth during last week for a trip to the Continent. Flying time totalled 37 hr. 20 min.

NORTHAMPTON

Fogs and snow restricted flying considerably, although one brave member managed to obtain a little cross-country instruction, flying to Brooklands and back. It is anticipated that the Pytchley Hunt will arrange to meet at Sywell Aerodrome in the near future.

MARSHALL'S

The flying times at Marshall's School during the week ended December 12 totalled 32 hr. 50 min. No flying was possible on the 8th owing to fog and flying has also been rather restricted during the week. Mr. Mitchell has passed the tests for his instructor's licence.

LEICESTERSHIRE

Some forty flying members of the Club held their annual pilots' supper in the clubhouse on November 29. The chairman of the flying committee, Mr. R. C. Winn, was in the chair, and flying experiences were duly recounted. The month of November was not a particularly good one from the flying point of view, but a total of 41 hr. 55 min. was logged and Mr. F. G. Gill made his first solo.

BORDER

A Border raid is being planned by the Newcastle, Border and Scottish clubs. Glasgow and Perth are making the raid, which is tentatively arranged for December 19, though it may be postponed until the new year. The attack will be against Carlisle, which will be defended by the Newcastle Club and, of course, the Border Club. Weather conditions have retarded flying, and during the last week only 9 hr. 40 min. were flown. Mr. R. Ellis passed his altitude test.

NORFOLK AND NORWICH

Although the club's new interest in gliding should not officially appear until the New Year, Mr. A. D. Firman, the hon. instructor, has already started his task. In power-flying matters Mr. J. D. Alston made his first solo during the week. Boulton and Paul have started on the construction of the new squash court, which should be ready before the end of next month. On next Saturday afternoon the new two-seater Tipsy is being demonstrated at Mousehold.

YORK AND LEEMING

The annual dance will be held at the Grand Hotel, Harrogate, on Wednesday, February 9, at 8 p.m. During the month of November 77 hr. 10 min. was recorded, and for the week ended December 9 a further 10 hr. 5 min. Mr. A. Reeder carried out his "A" licence tests. Work on the new concrete apron is going right ahead, and it is hoped that the construction of the new hangar will be put in hand shortly after Christmas. The club will be closed for the Christmas holidays on December 25 and 27, but will be open on December 26.

SOUTH COAST

The generally prevailing bad weather has curtailed flying activities at Shoreham. Mr. Pashley has, however, been kept busy giving members ground instruction. Other clubs and private owners are reminded that an arrival competition is being held on Sunday, December 19, between 11.30 and 13.00 hours. A prize of £5 5s. will be presented to the pilot arriving nearest to the sealed time. Lunch will be available and club secretaries are requested to notify the South Coast secretary of the approximate number to be catered for. The Gorringe cross-country handicap competition will be held on January 23.

BROOKLANDS

The Tramps' Party was a huge success. The variety of the tramps was largely due to the assistance of Mr. Arthur Woods, of Warner Bros., who helped members to make up. It would seem even tramps are becoming dress-conscious. The first of the series of tea-dances was held on Sunday, and by their popularity it would seem they have come to stay. A Christmas good will flight to Shoreham aerodrome is to be made next Sunday. An arrival prize of £5 5s. is offered, and the zero second is between 11.30 a.m. and 1 p.m. The clubhouse and flying school will be closed from Monday, December 20, until Friday, December 31 inclusive. There will, however, be a full service for private owners, both local and visiting.

Resurrection

USING a number of D.H.53 parts, Luton Aircraft have recently completed a little single-seater for Mr. R. A. Hopkinson. The machine, which is called the Martin, is powered with a 36 h.p. Cherub III, and has a performance which is equal to that of the present-day "truly light" machine. The test flights were made at Dr. Myles Bickerton's private aerodrome at Denham.

Another Reading Party

THE Reading Aero Club is organising another party on January 6 at their headquarters in the Falcon Hotel. The date being Twelfth Night, the party will be a Bal Masque, unmasking at midnight. Guests may wear any fancy dress they please, or a cloak and a mask over their ordinary clothes. There will be a running buffet, and tickets (7s. 6d. single, 12s. 6d. double) may be obtained from the secretary at Reading Aerodrome.

Airwork Service

FOLLOWING a particularly strenuous year it has been decided to reorganise the Airwork Service department. The whole of the present personnel and equipment will be taken over by a new firm to be known as the Airwork General Trading Co., Ltd., which will obtain the necessary additional plant for expansion in the fields of general engineering, sheet-metal and machining work, and the production of parts and accessories.

Mr. F. H. Hinton, previously works manager of Airwork, will act as general manager, and Mr. W. G. Andrews, managing director of Airwork Engine Service, Ltd., will be managing director. The other directors are Mr. F. A. I. Muntz and Mr. M. D. N. Wyatt.

The new arrangements will not affect the usual repair and maintenance services in any way, but plans are now well advanced in the matter of the erection of new workshops to cope with the general extension of business.

Private Flying

Local Assistance

FOR some time that almost remorselessly energetic honorary secretary for the Eastbourne Club, Capt. E. I. Short, has been endeavouring to obtain the support of the local council. He has at last succeeded in encouraging the Finance Committee to agree to the provision of a grant of £108 per annum for the next seven years, and has also obtained a lease on the land, with an option to renew for the same period of time. This is probably the first occasion in which a town council has, so to speak, subsidised a private flying club, and the particular advantage is that the Eastbourne Council is now an interested party to the future development of the Eastbourne Club.

The I.A.C. Liquidation

THE Irish Aero Club, which has been in operation for nine years, has decided to go into voluntary liquidation. The winding-up of the club has, it is stated, been brought about by lack of enthusiasm on the part of the members. Although the club had a nominal membership of about 140, barely 20 of this number have taken an active part in club affairs.

The club was established at Baldonnel Airport in 1928, but received very little encouragement from the successive Governments. Mr. Cosgrave's Government gave one grant of £1,000, and this, together with the profits from the various Irish Aviation Days and the club's share of the proceeds of the "air circuses" which toured the country, enabled it to carry on. Within the past two years, however, the novelty has worn off the circuses and receipts from this source have dropped considerably. In May last one of the club's two machines was completely wrecked in a crash in County Wicklow and the second machine was damaged recently.

The more enthusiastic members hope another club will be established when the new civil airport is opened at Dublin.

Two Guineas a Time

THIS being an argumentative age and pilots being as argumentative as any, the Air League has decided to offer a two-guinea prize each month to its members for an essay or article on any aviation subject. These must be confined to 1,500 words and will be judged on the 15th of each month.

Needless to say, this opportunity provided for expressing views is only one thing for which the Air League of the British Empire exists. There are, however, a large number of people who do not know what the League has done during the last twenty-eight years. It has, for instance, for the last three years, given hundreds of lectures throughout the winter months. Assistance has been given to some 200 young men to learn to fly, and 4,000 juniors have been enrolled and have been given 150 aviation prizes. Members, too, enjoy free insurance for many classes of aviation risks, and, finally, the efforts of the League have brought more than £26,000 to air charities.

During next year it hopes to start local branches at all the civil aerodromes and to embark on the formation of Air League Cadets at every local branch. It is offering challenge trophies to the Royal Aero Club, the British Gliding Association, and the Society of Model Aircraft Engineering; it hopes to organise debating dinners for members and guests; and it will have an annual dinner and ball. For those who may be interested, it should be mentioned that the Air League has recently changed its official address. This is now at Maxwell House, Arundel Street, Strand, W.C.2.

Failure of an Air Display Concern

AT a meeting of creditors of Aircraft Demonstrations, Ltd., recently, the Official Receiver said that the company was formed in November, 1936, to give aerial displays throughout the country. The nominal capital was £100, but only two signatory shares of £1 each were issued.

Mr. F. MacKenzie MacGregor and Mr. Sidney Randolph Vennervald were appointed the first directors, but they had stated they were only nominees and that Mr. H. A. C. G. Barker and Mr. J. M. King acted as *de facto* directors. In February the company purchased for £544, which had not been paid, three aeroplanes for use in a display. A number of engineers, pilots, parachutists, and the only British "bird-man" were engaged and the company began its tour with a display at Abridge in April, 32 other towns in England being visited on successive days.

Arrangements were also made for a tour in Ireland. The last display was given in August, the employees were discharged, and one aeroplane was flown to Croydon and stored. Another crashed at Kinsale and the machine was still in the field, where it was left after being dismantled.

The failure of the company was attributed by Mr. Barker and Mr. King to omnibus strikes and bad weather, also to the boycott of the display in the Irish Free State following the border outrages at the time of the King's visit to Ulster.

The chairman said that the company, with an issued capital of only £2, had incurred liabilities of nearly £6,000 over a comparatively short time, while the assets consisted of cash in hand 10s. and aeroplane valued at £177 and book debts £59.

More Revelry at Reading

THE second annual dinner and dance of the Service Department at Phillips and Powis Aircraft went off according to plan last Friday. Over 100 sat down to dinner and were regaled, disregarding the gastronomical side, with some figures for the past year's work. The Department maintained machines which had done 12,000 hours flying; 428 machines were received for overhaul, repair and C. of A. work; 730 private-owner visitors dropped in for petrol, oil and minor work; and 118 engines were overhauled.

Capt. "Don" Ayre proposed the health of the guests and made a delightful speech, punning the names of his colleagues. Mr. Bennett replied. Mr. Gates proposed the ladies, and Mrs. Parrot responded. Mr. Jock Cameron said some very nice things about Mr. Ayres.

The London Club's Loss

IT is with regret that we record the death, at the early age of 42, of Mr. A. E. Mitchell, the chief ground engineer of the London Aeroplane Club. He had been in the service of the club almost since its inception and was very well-known both to members and to visiting pilots. A subscription list has been opened for the benefit of his widow and two children, and any donations from friends should be sent to the Secretary, The London Aeroplane Club, Hatfield Aerodrome, Herts.

Not-so-grim Lecturing

FLT. LT. TOMMY ROSE is nowadays in great demand as a lecturer—which fact, if you have ever heard him lecture (though that is quite the wrong word) is understandable.

On Friday evening we had that pleasure, when he gave a talk on his flying experiences before members of the Public Schools Business Society. His anecdotes, pruned of the Rose trimmings and without the Rose manner of delivery, quite defy reporting. One just listens to a tale of a violent forced landing witnessed by only an aerodrome watchman in his night-shirt ("Well, so I'm dead at last"); of a low-altitude search for Cairo in fog and darkness, with the ultimate sighting of an airport beacon, which turns out to be a cinema's neon sign advertising "What Price Glory?"; of a deputy mayor in Africa who had pleasure in welcoming "Mr. Tom Mollison, who has flown from England in 37 days 6 hours"; one just listens to these things and out-Audreys Little Audrey.

Three Months Hard

DURING the last few months a good deal of useful work has been carried out in the development of the aerodrome at Barton, Bedfordshire, which is the home of International Aircraft.

This concern has done the necessary work without assistance of any local authority, and in the three months since August, when the Air Ministry granted a provisional licence, 500 yards of cable have been laid underground, 20 acres have been levelled and sown, 300 trees and 1,500 yards of particularly tough hedge have been cut down and the necessary drainage has been done. The aerodrome now has its own artesian water supply and the usual marker boards and circle are in place.

A clubhouse is in course of construction for the use of the Bedford School of Flying, the chief instructor of which is to be Mr. L. C. Hilditch.

The Successful Ones

THE following candidates, whose names are arranged in alphabetical order, have passed the October examinations for navigators' licences:—

FIRST CLASS.—Alderson, M. R.; Ross, I. G.; and Williamson, R. J.

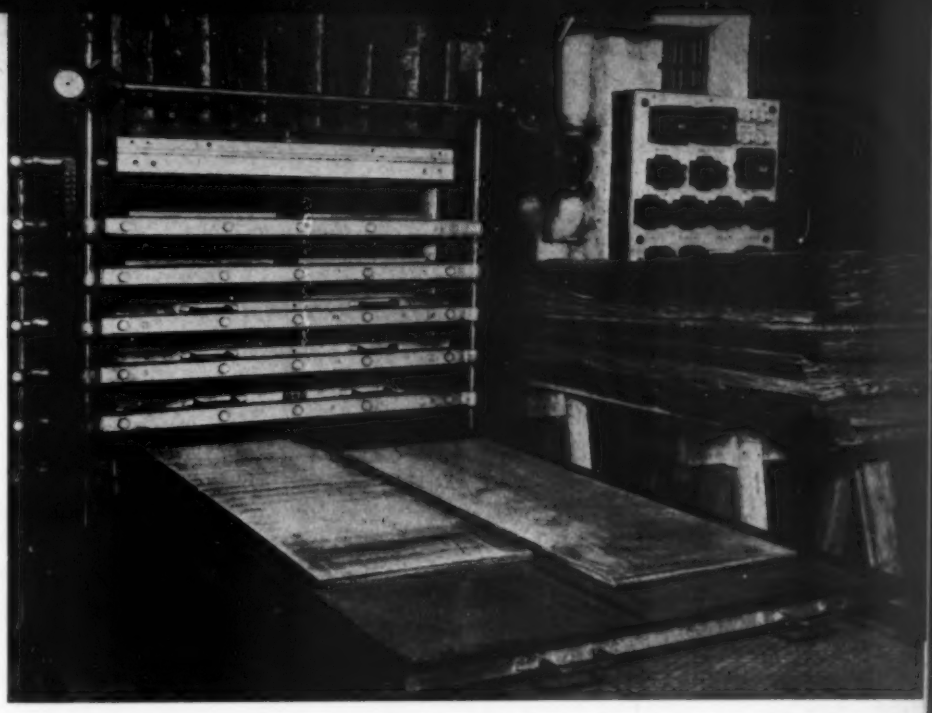
SECOND CLASS.—Adam, J.; Annand, A. D.; Ashfield, G.; Beach, J. W. F.; Blackmore, J. P.; Boore, L. C.; Bridgen, H. R. P.; Butler, C. A.; Cleife, V. E.; Cornish, H.; Deacon, E. W.; Eagleton, N. F.; Gautrey, R. W.; Gavshon, J. E. V.; Griffiths, C.; Griffiths, W. E. B.; Harvey, R. B.; Higgins, J. S.; Hill, L. T.; Howes, A. M. D.; Hunt, T. M.; Hutchins, C. J. K.; Kendrick, J. S.; Key, G. C. O.; Little, E. J.; Moseby, W. G.; Papps, P. S.; Parsons, E. I.; Paterson, P.; Perry, C. D.; Pitts, W. C.; Rainsford, F. F.; Rees, P. E.; Riley, C. E. F.; Rose, R. H.; Saben, L. W.; Sargent, J. P.; Scadding, A. C. J.; Searby, J. H.; Shaw, D.; Sisley, A. F. M; Smyth, T. L. S.; Stidolph, R. N.; Swain, C. D.; Symonds, W. E.; Theron, T. R.; Thompson, J.; Uprichard, W. G.; Wigram, A. F.; and Williams, F. E.

One hundred and six candidates sat for the examinations—four for the first-class and 102 for second-class licence. The next examination will start on April 25, next year, for the first-class licence, and on July 17 for the second-class licence.

THE CASE for WOOD

Mechanical and Other Properties Improved by Impregnation with Synthetic Resins

By BRUNO JABLONSKY



Manufacturing "reinforced" wood. At the far end of the piled veneers on the right can be seen the ends of the added laminations. The compressed finished boards are seen in the foreground leaving the press.

SINCE the early days of aviation two schools of thought have been in opposition, one favouring metal and the other wood for constructional purposes. The rapid development of high-grade steel and light alloys, and the increasing demand for uniform materials and mass production, popularised metal, which offered such advantages, with the result that wood was more and more neglected.

The known disadvantages of natural wood also made it unsuitable as a structural material because of the ever-increasing demands for performance and durability of modern aeroplanes. Those who favour and still believe in wood, however, did not rest, and methods have been discovered and developed by which the disadvantages of wood have been eliminated, and its physical properties vastly improved. It can now be so treated that it possesses uniform characteristics similar to those of metal.

Such "Improved Wood" is now regarded by many aircraft designers as showing considerable promise, and in some respects it can even be said to be superior to metal. Hence it may be of interest to hear more about the characteristics of this material.

First, let us review the reasons why natural wood has failed. The main characteristic of *natural* wood is its variation of moisture content with changes in humidity. This makes it unsuitable for modern aircraft construction where carrying capacity and strength of construction must remain unaffected by varying atmospheric conditions.

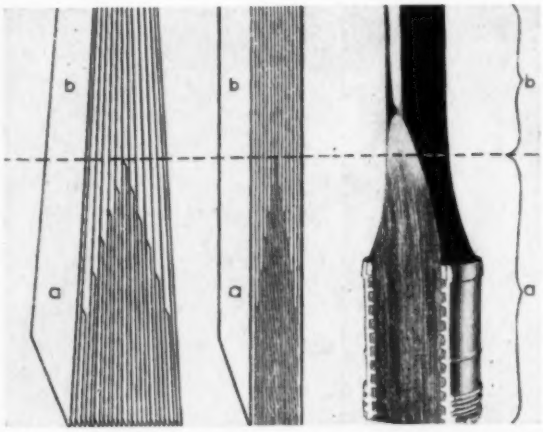


Fig. 1. Diagrammatic representation of reinforcing wood with extra laminations, before and after compression. The reinforced portions, a, would be used, for example, in the root of an airscrew blade (right), the plain portions, b, in the blade itself.

This characteristic is more inherent in woods in which cells exist in a larger proportion than fibres. Therefore, very light wood, such as silver spruce, with its spongy structure, is not so ideal as its lightness would indicate. Silver spruce for aircraft construction was originally introduced in Europe by the Wright Brothers, and is still in use to-day, with the difference, however, that its surface is now treated and protected against moisture. This protection, however, in most cases, only reduces the absorption of moisture without completely eliminating the constant change of moisture content.

With change of moisture the strength of all kinds of wood is also considerably influenced, and the designer has to allow a large margin in his stress calculation in order to meet these varying factors. A further disadvantage of ordinary wood is its low compression strength in the direction of the fibre, though it possesses high tensile strength.

Homogeneity

It was apparent that, in order to make wood more suitable for aircraft construction, the first essential step was to change the heterogeneous character of the material into a homogeneous one. Here the chemist deserves, in the first place, the merit of having developed a moisture-free synthetic resinous glue of excellent adhesive and moisture-resisting qualities.

The aircraft industry in general has given considerable impetus to experiment and to the development of materials based on wood. After their high requirements have been met it is expected that wood in this new form will soon find its place in other industries. The high standard in aircraft construction set such limits that only a material of highly improved quality could have any chance of general adoption. What has already been achieved in metals as far as strength-weight ratio is concerned sets quite distinct physical properties as minimum aims for any substitute material.

It was expected that if an *improved* wood attained satisfactory strength, durability and uniformity, without undue increase in weight, its other important advantages would ensure it outclassing metal in many ways. Wood is an excellent structural material where only tensile stresses exist, and there even natural wood is superior to light alloy metals and steel. Its compression qualities are, however, very low and their improvement was necessary. Where bending forces exist, as, for example, in spars, struts, airscrews, etc., wood is superior to metallic materials as long as the stresses occur within the elastic limit, and, moreover,

(*Continued after double centre pages.*)

A workman reveals the soundproofing in the cabin walls of the Martin 156.

THE RUSSIAN MARTIN

Four-Cyclone Flying Boat of 63,000 lb. Gross Weight

The engineer's instrument panel on the new Martin. This is quite independent of the pilots' panel and gives data on the behaviour of the four 850/1,000 h.p. Wright Cyclones. The cockpit panel is comparatively simple.

CONSIDERABLY larger than the Short Empire, Martin 130 Clipper and Sikorsky S.42B types of flying boat, the 63,000-lb. Martin 156 monoplane built to the order of the Russian Amtorg Trading Corporation is now making its initial flights.

Following the same general lines as the smaller Model 130 used by Pan American, the new machine retains the characteristic Martin "seawings," which not only provide lateral stability on the water but hold 4,260 gallons of fuel and contribute in a fair measure to the lift.

The new boat, unlike its predecessor, incorporates twin fins and rudders, which lessen the "hunting" tendency.

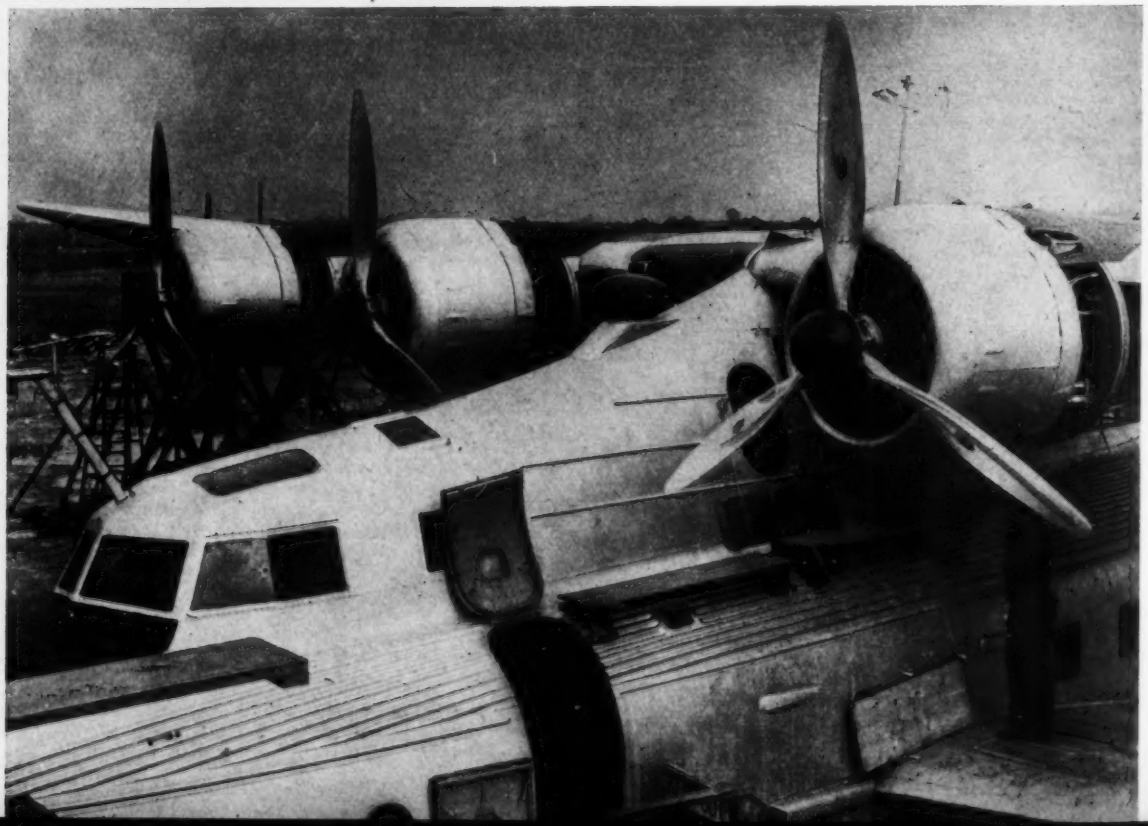
The engines are four "G"-type Wright Cyclone nine-cylinder radials rated at 850 h.p. at 5,500ft. and delivering 600 h.p. at 12,000ft. for cruising. They are housed in long-chord cowlings with cooling gill flaps round the trailing edges. These latter are unusual in a Cyclone installation. "Quick" type airscrew brakes are fitted.

Three passenger compartments and a lounge accommodate 46 passengers by day and sleep 26 by night. Heating is provided by engine-warmed prestone.

The commercial significance of the boat is that it could fly, according to manufacturer's estimated figures, from New York to London (3,465 miles) in just under 24 hours with fuel for 1,000 miles in reserve while carrying a 7,500 lb. payload. The disposable load is about 52½ per cent. of the all-up weight.

It is rumoured in America that the 156 will be used by the Russians for experimental services over the North Pole.

In the absence of definite data, the following estimated performances are of interest: the take-off occupies 35 seconds; level flight can be maintained with only three engines (at normal rated power) at 10,000ft.; the boat will cruise at 145-170 m.p.h.; and the top speed is something like 190 m.p.h.



A close-up of the forward upper portion showing the installation of the Cyclones with their gilled cowlings.

At Cricklewood: His Majesty watches riveting on a wing spar. On the left are Mr. S. R. Worley and Lord Swinton and, on the right, Mr. F. Handley Page. (*Flight* photograph.)

A ROYAL VISIT

The King's Tour of the Vickers, Hawker and Handley Page Works

SHORTLY after the Royal Air Force came into being, Prince Albert received training at Cranwell, and was posted to the staff of Sir Hugh (now Lord) Trenchard, then in command of the Independent Air Force in France. Soon after the War the Prince gained his wings as a pilot, having learned to fly at Croydon.

Prince Albert, as George VI, our present King, has never lost the understanding of aeronautics which that early training conferred. And when, on Wednesday and Thursday of last week, he visited three of our leading aircraft factories, he showed by his questions and comments that he has kept in touch with modern developments.

The organisations thus honoured were the Vickers works at Brooklands, the Hawker assembly shops at the same aerodrome, the Hawker works at Kingston-on-Thames, and the Handley Page factory at Cricklewood.

On the Wednesday His Majesty, who was accompanied by Lord Swinton, Secretary of State for Air, and by Wing Cdr. E. H. Fielden, Captain of the King's Flight, first visited Vickers, where his arrival was a surprise to the workpeople.

He was received by Sir Charles Craven, chairman and managing director of Vickers-Armstrong, Ltd., Sir Robert McLean, chairman of Vickers (Aviation), Ltd., Mr. Westbrook, general manager, and Mr. Pierson, chief designer.

Work continued during the visit, and the King asked many questions of the operatives. He was particularly interested in Mr. B. N. Wallis's geodetic system of construction, and climbed up to inspect the cockpit of a Wellesley. Afterwards he saw one of these machines taken up by Flt. Lt. J. K. Quill.

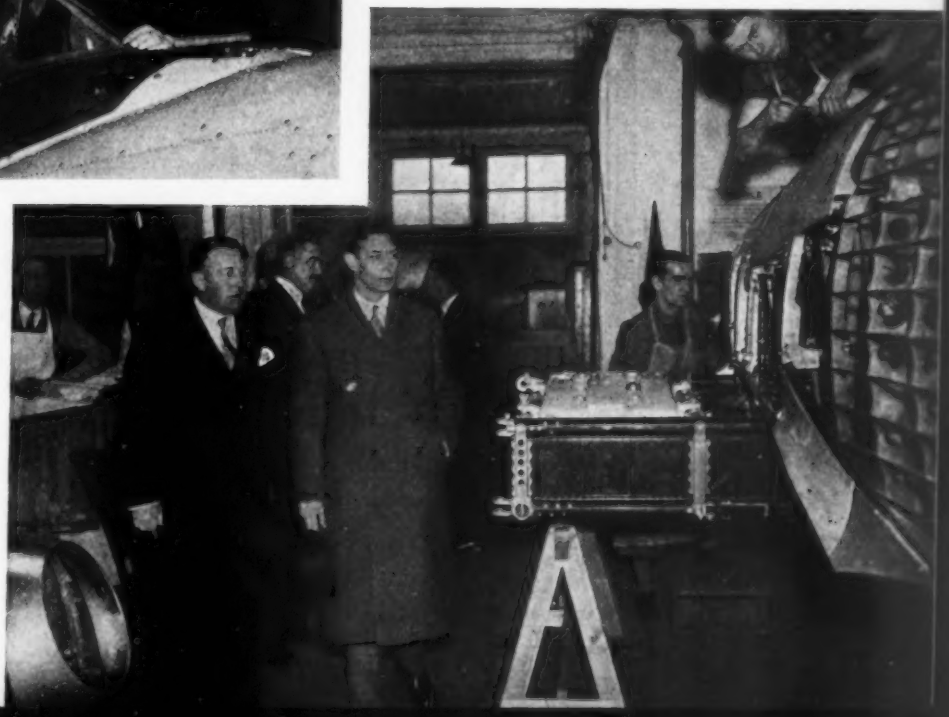
He then crossed to the Byfleet side of the aerodrome in order to visit the Hawker shops, where he was received by Flt. Lt. P. W. S. Bulman. From there His Majesty travelled to the main Hawker factory at Kingston, where he was met by a group of directors and members of the staff, including Mr. F. S. Spriggs (managing director), Mr. F. I. Bennett, Mr. S. Camm, Mr. H. Chandler, and Mr. R. W. Sutton.

Here he made a complete tour of the works, which included the experimental departments, and was shown the very latest designs. Among the machines which he saw in production were Hurricanes and Henleys.

On Thursday morning, at Cricklewood, the King, accompanied by Lord Swinton and Wing Cdr. Fielden, was received by Mr. F. Handley Page, Mr. S. R. Worley (chairman), Mr. J. Hamilton (director and works manager), Group Capt. Maycock, and Capt. J. H. Cordes. He was first shown a model of the H.P. Harrow, the outstanding features of which were outlined by Mr. Handley Page; he was then conducted round the works and shown the construction of these features in detail. He spent a long period in the fuselage of a Harrow, having the controls, gun gear, and other equipment explained to him.

The King concluded his tour by an inspection of the firm's fine new canteen, and was cheered by hundreds of operatives on leaving.

(Above) At Brooklands: The King took particular interest in the Wellesley, which will be the research machine for the new R.A.F. Long-distance Flight. He is seen with Mr. T. C. L. Westbrook and (right) Mr. Rex Pierson.



(Right) At Kingston: His Majesty, accompanied by Mr. F. S. Spriggs, sees Hawker production in full swing.

(*Continued from page a.*)

one is not so much restricted in the choice of sections owing to the lower specific weight of wood.

Important for aircraft design is that wood, on account of its excellent elasticity, can be stressed up to the elastic limit without suffering any permanent change of shape. This is not the case with metal. The easy jointing of wood by gluing is always appreciated in aircraft construction, and by using a sufficiently large gluing area large forces can be transmitted. Furthermore, quick delivery, lower price and easy working are much in favour of wood, and, last but not least, the damping effect against noise and change of temperature is of decisive influence in giving wood preference over metal, *provided its above-mentioned disadvantages have been eliminated.*

Different methods of improving wood have been suggested from time to time, but it is only recently that, out of many, a few ideas have materialised from which really practical results have been obtained.

For the development of "Improved Wood," moistureless synthetic resinous glues have been used. This material has proved entirely satisfactory for insulating the cells, and thus protecting the wood against atmospheric influences. Combined with a high adhesive quality, it was also found to be a superior glueing agent.

"Improved Wood"

The material described in this article has already been partly adopted in this country, but far more so in other countries, notably in Germany, for practical aircraft constructions. We do not, therefore, attempt to deal with other fibrous materials reinforced with a synthetic resin.

The "Improved Wood," as we call our material, is built up of a number of thin veneers. Their thickness is decided in accordance with the required strength and density. The thinner the veneers the greater the degree of uniformity of material obtainable. It is then made possible to spread knots or any other defects over a larger surface, thereby avoiding loss of strength and waste of timber. Furthermore, the thinner the veneers the greater the number of cells cut open and the larger the surface exposed to impregnation with synthetic resin. The thicker the veneers the higher the pressure requisite to close and fill the cells or pores.

Although "Improved Wood" built up of thinner veneers is more expensive, this is fully compensated for by the greater homogeneity and strength of material thus obtained. "Improved Wood" of veneers thicker than 1 mm. is more apt to change its characteristics than wood with thinner veneers, the pressure on which has a permanent effect, whereas with thicker veneers a tendency to rebound and to open the compressed cells remains. "Improved Wood" of thin veneers shows approximately 4 per cent. variation in mechanical characteristics compared with a 40 per cent. variation in natural wood. Stress calculations for "Improved Wood" can, therefore, be carried out similarly as for metal.

Climatic conditions hardly affect "Improved Wood" at all, the absorption of moisture without any kind of protection being only 6-7 per cent. after 50 hours' immersion in water. Comparative tests are easily made by leaving a piece of natural wood and a piece of "Improved Wood" of the same size in water. After a few hours it will be noticeable that the natural wood is distorted, while the "Improved" remains absolutely unaffected.

Two Methods

At present there are two methods of improving wood in practical use. In one method the synthetic resin is used as a filling material for the wood; comparatively thick plies are soaked in resinous material for some time before being pressed. The boards are precoated and the resinous material is allowed to fill the cells prior to application of pressure and heat in special dies.

By the other method synthetic resinous material is used as a binding agent *only*, and is applied simultaneously with pressure and heat, without precoating or impregnating the wood. Thin veneers are more essential in this case so as to fill up the cells and destroy the porous character of the wood, thus making the impregnation more complete. By destroying the pores (as in the second method) a very thin synthetic resin film is required as glue only, the absorption of resin being reduced to a minimum. Owing to less resin in this case, the tensile and shear strength-weight ratio is better. The adhesion power is also better. The resistance to moisture absorption is equally good in either case.

As can be seen, the manufacturing method has a considerable bearing on the physical properties of the material. "Improved Wood" of equal specific weight is not necessarily of similar physical character. The exact timing of pressure and heat is, in the improvement of wood, just as essential as in metal.

The joining and scarfing of "Improved Wood" not previously soaked is nearly as good as in natural wood. It will be readily understood from the foregoing that, as the physical properties of the "Improved Wood" can be varied, it is possible to give this material varying strength as and where desired.

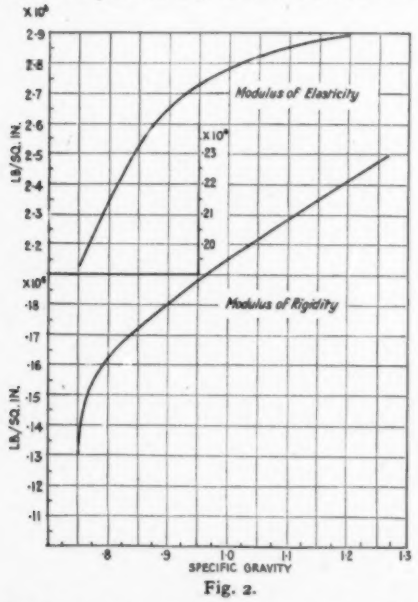


Fig. 2.

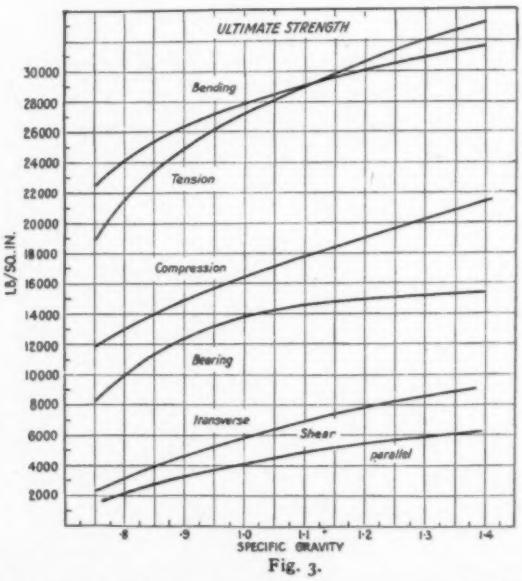


Fig. 3.

Left, Fig. 2, curves showing the variation of moduli of elasticity and rigidity with specific gravity. On the right, Fig. 3: How ultimate strength is improved.

The recognition of this fact has led to the development of a method of reinforcing "Improved Wood" wherever increased strength is required, e.g., where fittings have to be fixed and where, by the use of a thread or bolt holes, a reduction of sectional strength occurs. These local increases of strength enable material of uniform outside dimensions to be used where, as with other materials, an increase of thickness would be essential to compensate for the loss of sectional strength. The suitability of smaller standardised fittings with fewer bolts is the result, the saving of weight thus effected fully making up for the increased specific gravity of the reinforced parts.

One method of making "Reinforced Wood" which has been in successful use for some time is that known as the patented "Heine Process," in which a number of extra veneers, varying as to the required strength, are interleaved and pressed together with the rest of the material to a uniform thickness.

The drawing published on p. *a*, Fig. 1, shows the principle of this method, and also that, by varying the length of the interleaved veneers, a zone of gradual transition is created, thus avoiding any dangerous sudden sectional change. This method of reinforcing has already been successfully employed in roots of airscrew blades, spars, etc. (Heine-Jablo Propellers, Ltd.).

Increase of strength rendered possible by improving and reinforcing wood is shown in Figs. 2 and 3.

"Improved Wood" is compressed wood of uniform density. "Reinforced Wood" is "Improved Wood" of varying density and strength.

COLLEGIATE COMPANIONSHIP

Chelsea Dines and Dances

"CHELSEA" has become synonymous, in flying circles, with the College of Aeronautical Engineering. "He was trained at Chelsea" is an expression now frequently heard, and is at once understood to mean that the young man in question has been a student at the Chelsea College and has passed his examinations. It has become customary for the Automobile Engineering Training College and the College of Aeronautical Engineering to hold an annual dinner and dance, at which the Principal, Mr. C. H. Roberts, outlines the progress made by the colleges during the year.

This year, at the dinner held at Grosvenor House on Tuesday of last week, Mr. Roberts was able to report not only good steady progress at both colleges, but some interesting innovations in the matter of special work on hand. For instance, the College of Aeronautical Engineering has been entrusted with the construction of the first aircraft to be designed for the Air League of the British Empire, and with the building of a new type of light aeroplane for a well-known aircraft designer. The College is offering a prize of £100 for the best design for a light aeroplane, and will carry out the final drawings, stressing and building of the first experimental machine. The offer is not confined to students of the College, but is open to anyone, because, as Mr. Roberts explained, it is felt that there must be excellent brains hidden in drawing offices and workshops throughout the country. The competition has drawn entries from places as far apart as Holland, California, Canada and South Africa. By December 31, the closing date, they hoped to see some very interesting designs.

Two Industries

Lt. Col. Mervyn O'Gorman responded to the toast of the automobile industry, while Mr. Handley Page replied for the aircraft industry. In doing so he jestingly complained that Col. O'Gorman had taken all the letters of the alphabet (on the menu the following appeared after his name: C.B., D.Sc., M.I.C.E., M.I.Mech.E., F.R.Ae.S., M.I.E.E., M.I.A.E.), and said that he (Mr. Handley Page) was responding for an industry that, compared with the automobile industry, was unfortunate. In the aircraft business they had no patron like Lord Nuffield, and their troubles were passed over in silence.

The aircraft industry, Mr. Handley Page continued, was composed of a variety of companies. He understood that some had shareholders who received circulars. Others even received bonuses, but that was only a catch, and was followed by requests for subscriptions for more capital! However, he did not want students to be downhearted about all that. They had a great future. The aircraft industry had passed and was passing through a difficult period. After a long period of disarmament, during which the industry had been reduced to a total of something like 2,000 people, there was a sudden expansion, and in addition to finding the necessary workers, the industry had had to change from the familiar biplane type of aircraft to the monoplane. This had meant a complete change in manufacturing technique. However, the superb firms in the industry had made a good job of it, and he was tempted to quote William Pitt's words: "You have saved yourselves by your exertions; may you save Europe by your example."

Lt. Col. Sir Francis Shelmerdine, Director-General of Civil Aviation, in proposing the toast of the Colleges, said he could claim to have been in close association with the College of Aeronautical Engineering since its inception. The College was now doing work of national importance, and he had been struck by the close association of the two industries, automobile and aircraft. Sir Francis jokingly remarked that this close association should be dear to the heart of Lt. Col. Moore-Brabazon, who wanted to give the control of civil aviation to the Ministry of Transport. After what Col. O'Gorman had said [he had been very scathing in his comments on speed restrictions, Belisha crossings and so forth] Sir Francis would very much hesitate to go to that Ministry.

Pointing out that he received no commission from the College, Sir Francis said he was frequently asked by young men what were their chances if they went there. His reply was that if they got their diplomas they would get a job in the industry—the job depended on individual ability, but a job was assured. The College did train men who would one day be the administrators of civil aviation. Its aim was to instil a sense of responsibility rather than to train students to pass examinations. That was training on the right lines.

Lt. Col. Moore-Brabazon expressed the thanks of the Colleges to Lord Wakefield for his scholarships and for his many other contributions to aviation. He pointed out that when the aircraft industry was in a tight corner over the expansion it went to the motor industry for help [he was referring to the shadow scheme]. Of Mr. Handley Page, Lt. Col. Moore-Brabazon said that he introduced the large aeroplane. Eveything about him was big, and even his humour was broad. He hoped that by way of a change Mr. Handley Page would enter for the College's small-aircraft design competition!

Kathleen, Countess of Drogheda, then presented a replica of the Drogheda Trophy to Mr. F. P. Whitehead, of the Automobile Training College, and Miss Amy Johnson presented a replica of the Mollison Trophy to Mr. H. A. Craw.

The rest of the evening was spent very enjoyably in dancing and in watching some excellent cabaret turns.

* * *

The Automobile College has now completed twelve years and the Aeronautical College six. There are 350 students under instruction, 269 at the engineering works at Chelsea and Fulham, 62 on aircraft and aerodrome work at Brooklands, and 19 obtaining final experience with co-operating companies in the aircraft industry.

During the year ended September, 1937, the following diplomas were issued by the Aeronautical College: 3 honours, 14 first-class passes, and 5 second-class passes. In external examinations (Royal Aeronautical Society) students obtained four first places in the Associate Fellowship grade and three firsts in the Associate Membership grade.

Eleven students qualified for Ground Engineers' Licences, 70 in category A, 69 in C, 43 in X, 8 in B and 3 in D.

Aero Engines, Ltd.

THE circumstances of the mutual termination of the licence agreement to manufacture Hispano-Suiza aero engines in this country are to be explained at the general meeting of Aero Engines, Ltd., to be held next Tuesday, December 21.

The chairman's speech (which was published with the report and accounts) will state that since the co-opting of Mr. E. C. Gordon England to the board as deputy chairman the company has made a rapid recovery, and that the directors have confidence that the period of losses is at an end.

A loss of £57,478 is shown in the accounts for the 13 months to July 31 last, as against a loss of £11,851 for the preceding period. The company was formed in 1935.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News: Official Announcements: Military Aviation Abroad

A Fairey Seal spotter reconnaissance floatplane (525 Siddeley Panther IIa) about to start a navigational training flight at Lee-on-the-Solent. (*Flight* photograph.)

The Cruise of the Londons

THE five Londons of No. 204 (G.R.) Squadron, after calling at Bahrein and Ras-el-Khaimah, reached Karachi on Sunday, and next day flew to Gwalior, in Central India, in just under six hours.

Waziristan War Honours

THE King has been graciously pleased to approve of the following rewards for gallant and distinguished services rendered in connection with the operations in Waziristan during the period November 25, 1936, to January 16, 1937:—

Distinguished Service Order.—Wing Cdr. (now Group Capt.) John Cotesworth Slessor, M.C.

Distinguished Flying Cross.—Flt. Lt. (now Sqn. Ldr.) Geoffrey William Tuttle.

Distinguished Flying Medal.—Corpl. James Oliver.

R.A.F. Benevolent Fund

AIR Vice-Marshal H.R.H. the Duke of Gloucester has notified the Council of the R.A.F. Benevolent Fund that he intends to make an annual contribution to the Fund.

The Armament Group

THE Armament Group will in future be known as No. 25 (Armament) Group. Hitherto it has not been distinguished by any number.

Vacancies for Apprentice Clerks

A NUMBER of vacancies which will occur in January next for apprentice clerks are open to boys whose ages will be not less than 15½ years and not more than 17¼ years on January 1, 1938. Applicants must produce either an approved school certificate or evidence that they have attained an approximately equivalent educational standard.

Full particulars of the conditions of entry and of service, and instructions regarding application, which must be made before January 1, are contained in A.M. Pamphlet 9, a copy of which may be obtained upon application to the Air Ministry, Boys' Department, Victory House, Kingsway, London, W.C.2.

A New R.A.F.V.R. Centre

ARRANGEMENTS have been completed for the entry of personnel for training as pilots in the Royal Air Force Volunteer Reserve at an aerodrome at Stapleford Abbots (Essex), and applications are invited immediately by the Air Ministry from candidates resident in the district served by this centre, namely London. The school will be operated by Reid and Sigrist, Ltd.

Training centres have already been established in the Birmingham, Bristol, Brighton, Coventry, Glasgow, Hull, Leicester, Northampton, Manchester, Perth, Reading and Southampton districts. Flying training centres are already in operation in the London district at Fairoaks, Gatwick, Gravesend, Hanworth, Hatfield, Redhill and White Waltham aerodromes.

Candidates for the London centres should address their applications to the Commandant, Royal Air Force Volunteer Reserve (London District), Staffordshire House, Store Street, Tottenham Court Road, London, W.1, and candidates in other districts to the Superintendent of Reserve, Royal Air Force, Hendon, The Hyde, London, N.W.9.

Moves, etc., of Units

HEADQUARTERS, Iraq Levies, moved from Hinaidi to Dhibban on November 16. Headquarters, Central Supplies Depôt, Iraq, closed at Hinaidi on November 17, and reopened at Dhibban next day. The unit hitherto known as "Supplies Depôt, Dhibban," has been absorbed in the Central Supplies Depôt.

The transfer of 25 (Fighter) Squadron from 11 (Fighter) Group to 12 (Fighter) Group has been cancelled.

The temporary Armament Training Camp at North Coates Fitties is not included in the establishment of No. 2 Air Armament School.

Armament Appointment

WING CDR. G. V. HOWARD, D.F.C., promoted on October 1, is appointed to the newly formed Directorate of Armament Development at the Air Ministry, to succeed Wing Cdr. L. G. le B. Croke, who has taken command of No. 233 (G.R.) Squadron at Thornaby.

Squadron Records Wanted

THE Commanding Officer of No. 218 (Bomber) Squadron, Upper Heyford, Oxford, wishes to hear from ex-members of that squadron with regard to experiences and incidents of interest. Should they have photographs or other mementoes of this unit which they are willing to give or to loan to the Squadron, the Commanding Officer would be very glad if they will communicate with him.

Air Force List

THE December issue of the *Air Force List* has now been published. It can be purchased (price 3s.) from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

Flare Paths

SINCE modern service aircraft require a longer run after landing than obsolescent types, it has been decided that the long arm of the flare path on R.A.F. aerodromes is to be extended from 250 yards to 350 yards.

In future, therefore, the flare path is to consist of seven glim or goose flares. Nos. 1-5 are to form the long arm of the "T," allowing a 50 yards interval between Nos. 1 and 2 and intervals of 100 yards between each of the remainder. Nos. 6 and 7 are to form the cross of the "T," 100 yards distant from, and at right angles to, No. 5.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

F/O. Frederick William Richmond and the Right Reverend H. Guy Bullen, M.C., M.A., Assistant Bishop of Egypt and Sudan, lost their lives in an accident which occurred at Pap Village, between Bor and Juba, Sudan, on December 7, to an aircraft of No. 47 (Bomber) Squadron, Khartum.

Sergt. Arthur William Butler and A/C.2 William Ernest Vincent lost their lives in an accident which occurred at Chesil Bank, Dorsetshire, on December 11, to an aircraft of No. 226 (Bomber) Squadron, Harwell, Didcot, Berkshire. Sergt. Butler was the pilot.

Royal Air Force Gazette

General Duties Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (December 1):—A. T. K. Shipwright, D.F.C., B. D. Nicholas, F. Whittle, E. C. Hudleston, P. F. G. Bradley, A. F. Britton, R. A. Chignell, A. C. Mitchell, F. C. Sturgiss, J. A. S. Outhwaite, P. J. H. Halahan, G. F. Macpherson, H. H. Chapman, K. F. T. Pickles, R. C. Hancock (Acting Squadron Leader), J. B. Fyfe, D.F.C., H. G. Wisher, H. J. Pringle, J. Cox, R. Stanley Darbyshire, N. W. A. Cullum, R. Harston, J. A. Easton, J. G. W. Weston, G. Silyn-Roberts, R. A. T. Stowell, C. E. St. J. Beamish, W. H. Hutton, J. D. Rutherford, C. R. Lousada, G. H. H. Procter, W. D. J. Michie, R. C. Jordan, R. B. Councell.

F/O. T. R. Vickers is promoted to the rank of Flt. Lt. (November 16).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—R. C. Meares, G. I. Pawson (October 20); A. P. W. Cane (October 30). Sqn. Ldr. G. H. Hall, A.F.C. (Retired) is granted the honorary rank of Wing Commander (March 1); Flt. Lt. D. R. Evans is placed on the half-pay list, scale B, from March 30 to 31 inclusive.

Equipment Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (December 1):—E. A. Slater, C. P. Wingfield, B. W. Hemsley, M.B.E., H. E. Young, P. H. Burt, L. V. Hirst, J. W. Mitchell, L. Taylor, L. Horwood, M.C., C. B. Horsfield.

Accountant Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (December 1):—C. E. Aston, B. G. Drake, S. C. George.

Royal Air Force Reserve

Reserve of Air Force Officers

General Duties Branch

L. G. Veevers-Carter is granted a commission as Flight Lieutenant in Class C (October 18). F/O. A. L. Brain is granted the honorary rank of Flight Lieutenant (November 10).

Royal Air Force Volunteer Reserve

Medical Branch

A. W. Badenoch, M.D., Ch.B., F.R.C.S., is granted a commission as Flight Lieutenant with effect from and with seniority of December 7.

Royal Air Force Appointments

General Duties Branch

Air Commodores.—T. E. B. Howe, C.B.E., A.F.C., to Headquarters, No 12 (Fighter) Group, Hucknall; for duty as Senior Air Staff Officer and on appointment as Air Officer Commanding (temporarily), 20.11.37. J. H. S. Tyssen, M.C., to Headquarters, R.A.F., Iraq, Hinaidi; for duty as Air Officer in Charge of Administration, 20.11.37.

Group Captains.—G. C Pirie, M.C., D.F.C., to Special Duty List; on appointment as Air Attaché, Washington, 18.10.37. R. M. Drummond, D.S.O., O.B.E., M.C., to Headquarters, R.A.F, Middle East, Cairo, Egypt; for duty as Senior Air Staff Officer, 20.11.37. F. P. Don, O.B.E., to Headquarters, Bomber Command, Uxbridge; for Air Staff duties, 10.11.37.

Wing Commanders.—G. V. Howard, D.F.C., to Directorate Armament Duties, Air Ministry, vice Wing Cdr. L. G. le B. Croke, 8.11.37. S. D. Culley, D.S.O., to Special Duty List; on appointment as Inspector, Royal Iraqi Air Force, 1.10.37.

Squadron Leaders.—A. E. Case, to R.A.F. Depot, Middle East, Aboukir Egypt; for Engineer duties, 20.11.37. C. McK. Grierson, to Headquarters, R.A.F., Far East, Singapore; for duty as Senior Personnel Staff Officer, 20.10.37.

Flight Lieutenants.—V. C. F. Streatfeild, to No. 4 F.T.S., Abu Sueir, 9.11.37. J. B. P. Thomas, to No. 77 (B.) Squadron, Honington, 23.10.37. R. E. G. Brittain, to No. 148 (B.) Squadron, Scampton, 23.10.37. D. B. D. Field, to Superintendent of the Reserve, Hendon, 22.11.37. A. W. Vincent and A. C. Martin, to No. 3 Anti-Aircraft Co-operation Unit, Hal Far, Malta, 20.11.37.

Medical Branch

Group Captain.—R. A. G. Elliott, to Headquarters, R.A.F., Aden; for duty as Principal Medical Officer and Officer Commanding R.A.F. Hospital, 11.11.37.

Squadron Leader.—E. Thompson, to Central Medical Establishment, London; for duty as Medical Officer, 20.11.37.

Flight Lieutenants.—D. G. Smith, to No. 8 (B.) Squadron, Aden, 14.10.37. E. S. Sidey, to No. 5 (A.C.) Squadron, Chaklala, India, 5.10.37. N. P. R. Clyde, to R.A.F. General Hospital, Iraq, Hinaidi, 6.11.37.

Accountant Branch

Wing Commander.—R. H. Cleverly, to R.A.F. Station, Cardington; for Accountant duties, 22.11.37.

Flight Lieutenant.—E. Smith, to R.A.F. Station, Manston, 22.11.37.

Equipment Branch

Squadron Leader.—J. K. McDonald, to Headquarters, R.A.F., Mediterranean, Malta; for Equipment Staff duties, 20.11.37.

Flight Lieutenant.—E. R. Berry, to Headquarters, R.A.F., Middle East, Cairo, Egypt, 20.11.37.

Owing to the greatly increased length of these lists as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.

FOREIGN SERVICE NEWS

That Breda 88

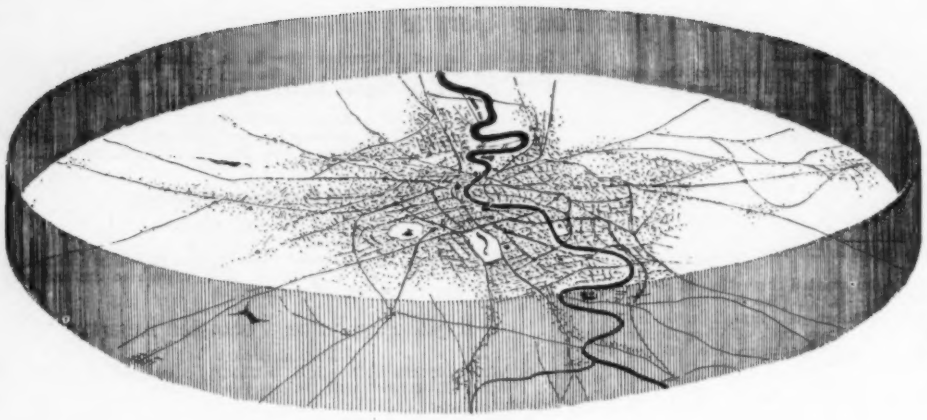
AS briefly recorded in *Flight* last week, Furio Niclot, the Italian test pilot, has broken his own speed record over 100 km. His average was 554.35 km./hr. and his machine the Breda 88 fighter bomber in which he had previously flown at 517.836 km./hr. For the latest attempt, however, it was powered with two of the new 875/1,000-h.p. Piaggio XI R.C. 40 14-cylinder radials in place of the French-designed Gnome Rhone K14s of the previous version. The Breda 88, with Piaggio engines, is in production for the Italian Air Force and is said by pilots to be stable and manœuvrable and to be as easy to take off and land as present standard types.

U.S. Base in Alaska

AN American naval air base has been established at Sitka Harbour, Alaska. A dozen Consolidated patrol-bombers have already arrived and hangars and workshops have been erected for their use. It is reported that there are plans to make a series of practice and survey flights over the Aleutian Islands during the winter with a view to determining the best location for larger bases in those islands which may be regarded as stepping stones toward Japan.

The Consolidated flying boats used are proving extremely successful, particularly for long-range work.

FOR PORTUGUESE INSTRUCTION : Part of a batch of Avro 626 comprehensive military trainers (Siddeley Cheetah V) at Avro's Woodford aerodrome prior to delivery to the Portuguese Government. Despite the fact that the 626 was designed some years ago it is still extremely popular. (*Flight* photograph.)



Air Comdre. Hearson mentioned balloons at 100-yard intervals. Sited by the "perimeter" method, at a radius of ten miles from the centre of London, this would require some 1,100 balloons. In this sketch, the "stockade" reaches to a height of two miles.

BALLOON BA

Veil of Secrecy Partly Lifted by Air Comd. Hears
Methods of "Siting" Balloons : 1918-ty Apron

AS readers of last week's issue of *Flight* will have gathered, the veil of secrecy surrounding the balloon barrage scheme has been lifted to a surprising extent in a lecture at the Royal United Service Institution. It is now possible to quote lengthy extracts from that paper, which was read on Wednesday of last week by Air Commodore J. G. Hearson, C.B., C.B.E., D.S.O., Air Officer Commanding No. 30 (Balloon Barrage) Group. Air Chief Marshal Sir Hugh Dowding, G.C.V.O., etc., was in the chair.

The lecturer began by saying that the history of balloon barrages was meagre and recorded experience in their use practically nil. These barrages were used towards the end of the 1914-18 war, but any effect they may have produced then was probably more moral than destructive.

Towards the end of the war, two or three so-called "balloon aprons" were used in the defence of London. These aprons were formed by tethering four or five balloons in a line and stretching between them a network of light steel cables. The weight of the network, even when constructed of the lightest cables, was a very serious load on the comparatively small buoyancy of anything but unhandily and expensively large balloons, and this resulted in a low barrage of little practical use. The network, too, tended to sag and so drag the balloons supporting it together into a bunch. When the balloons were hauled down the network between them also had to come down to the ground. If the locality of the apron were a populous one such as London, or even its outskirts, complications would result from lowering this steel network on to houses, trees, and even, perhaps, overhead power wires of the grid or tram and trolley-bus lines.

It could therefore be accepted that a modern balloon barrage would not take the form of "aprons," but would consist merely of the cables by which the balloons were held captive.

Not So Diaphanous

At first sight, such a defence might appear to be somewhat diaphanous, but if a few simple calculations were made it would be found that it was much more effective than might be imagined. Assuming an aeroplane of 70-ft. span passing through a line of balloons tethered at 100-yard intervals, there would be rather less than one chance in four of it hitting a cable, and if it did an "in-and-out" passage through the line there was about one chance in two of it hitting a cable—a pretty formidable risk which no attacker could afford to continue taking if those cables were lethal, i.e., if they would destroy an aeroplane which came in contact with them.

The modern bombing aeroplane, said the lecturer, was capable of carrying a useful load of bombs to as much as 25,000 ft., and therefore, in order to be insurmountable, a balloon barrage must extend to at least that altitude. For a balloon barrage such an altitude was to-day a thing of the future, though, perhaps, the not-very-distant future. When it became a practical achievement from a technical, operational and financial point of view, the tactics of air defence would probably have to be not merely drastically modified, but actually revolutionised, and the fighter, the gun and the searchlight might become auxiliary to the balloon instead of the reverse, as at present.

Though a modern bomber could carry its load of bombs to 25,000 ft., the effort necessary to do so was considerable, and therefore a balloon barrage of considerably less altitude might provide a very real contribution to the defence. A balloon barrage of even 10,000 ft. altitude, if it were lethal and of sufficient density, might at least reduce the fighter's task of finding its enemy by a depth of 10,000 ft. out of 25,000 ft.; and that 10,000 ft. was the murkiest part of the depth of atmosphere to be searched.

Every practical student of air attack tactics knew, said the Air Commodore, that the very low attack made by aircraft flying at a few hundred feet above the trees and house-tops was the form of attack least vulnerable to anti-aircraft fire and defending aircraft. This was due to the fact that the angular velocity of such aircraft about a gun or searchlight position was so high that there was insufficient time for the gun or searchlight to be trained on the target before it had disappeared again. Very low-flying aircraft were also a difficult prey for interceptor fighters, because they were difficult to locate and follow when viewed from above against the close background of an intricate countryside or urban area; even when they were located and reached the proximity of the ground seriously cramped fighting tactics.

A low-altitude balloon barrage supporting a sufficient density of lethal cables did seem likely to fill this gap in the defence, and, for this purpose, it need only be sufficiently high to drive the attacker up to an altitude at which he could be effectively dealt with by lights, guns and defence aircraft.

Of course, the balloons of a barrage of any altitude were very open to attack if flown by day in fine weather, but such conditions were those in which guns and interceptor fighters could act most effectively. The conditions of night and bad visibility were those in which a balloon barrage was most needed by the defence, and it was in such conditions that the balloons would be fairly immune from attack.

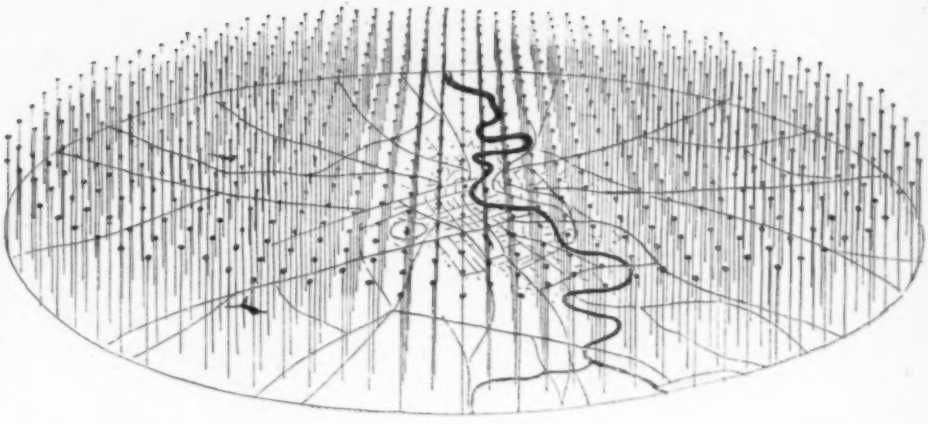
The first and most obvious method of siting balloons was to place them approximately on the perimeter of the area to be defended. If, however, the balloons were sited equidistantly *over* a circular area, the probability of impact was from one to two times as great, over 80 per cent. of the area, as it was when the same number of balloons were sited equidistantly round the circumference.

The lecturer called these two methods of siting "field siting" and "perimeter siting."

Methods of Siting

Assuming a circular area of twenty miles diameter to be defended and 600 tethered balloons for its defence, then: (a) With field siting over the area, provided the attacking aircraft flew as much as twenty miles on any course or courses within the area, there would be one chance in two of its hitting a cable if the span of the aircraft were as much as 70 ft. (b) With perimeter siting, if an attacking aircraft of similar span flew into the area at a normal through the line of cables and out again at a normal through the line of cables and, while inside, flew any distance necessary to find its objective, there would only be one chance in four of its hitting a cable. If it flew obliquely through the line of cables the chances of its hitting one were, of course, greater, but such a line of flight could, and probably would, be avoided in most cases.

One very obvious method of reducing the effect of a balloon barrage would be to fly through it in "line-ahead" formation



The "field siting" method advocated by Air Comdre. Hearson gives a greater chance of impact for a smaller number of cables. In this sketch some 600 balloons are sited at equidistant intervals over the same area as that shown in the other drawing.

N BARRAGES

Comd. Hearson in R.U.S.I. Lecture : Alternative 18-type Apron Obsolete : The Barrage and the Weather

with, perhaps, specially equipped aeroplanes in the van. Such a method of attack, which amounted really to "sweeping," would be obviously more effective against perimeter-sited balloons than against field-sited balloons. Dive-bombing was a form of attack which no defence scheme could afford to ignore, and it would be met to a certain extent at least by field-sited balloons; whereas perimeter-sited balloons would be of little or no value. Lastly, by using field siting, a barrage of very high impact probability could be achieved without the necessity of working balloons in dangerously close proximity to one another.

There were, of course, certain disadvantages to field siting as compared with perimeter siting. For the same number of balloons, field siting resulted in the balloons being appreciably further apart than was the case with perimeter siting, and this increased the difficulty of inter-communication between balloons and supply services for gas, petrol, etc. The supporting of one balloon crew by men from adjacent balloons was more difficult for the same reason. Further, it might be contended that field siting did not attempt to prevent the attacker from reaching his objective, but this objection was probably more apparent than real. In the case of a large, compact area, such as London, containing numerous different objectives, field-sited balloons seemed more likely to prevent a bomber getting to his particular objective than did perimeter-sited balloons round the area. Again, the moral effect of lethal balloon cables which, perhaps, would always be greater than the destructive effect, would probably be greatest when these cables were in the closest proximity to the objective. Probably a compromise between field and perimeter siting would prove the best.

Subtle—and Secret

The lecturer then turned to what he called the "lethality" of the cables. He said that a cable heavy enough to destroy a modern bombing aeroplane by the shock of impact, or strong enough to stand up to the tension which would be imposed by the forward flight of such an aeroplane, could not be carried to a sufficient altitude by a reasonably handy and inexpensive balloon. It was, therefore, necessary to adopt more subtle methods, and the Air Commodore added: "On this point I must content myself with assuring you that this problem of making the cable lethal against modern aircraft has been found capable of solution."

Should balloon barrages become effective factors in air defence, then undoubtedly counter-measures would be forthcoming and these were most likely to take the form of protective devices on aeroplanes; either on all aeroplanes or on special-duty cable-sweeping aeroplanes sent in advance of a raid. Such contrivances were difficult to fit on an existing design of aeroplane and it might well be found no easy matter to incorporate them in new designs. Methods of defeating them when they were incorporated were under consideration and test, for an expensive programme of balloon barrage defence would hardly be justified if the enemy's first counter-moves had not been anticipated and prepared for.

The lecturer then gave some "elementary information," as he called it, on the properties of hydrogen, the design of kite balloons, cables and winches.

Regarding the vulnerability of balloons, the lecturer said that losses due to enemy action might be of two kinds: the first would be due to collisions, which were not expected to be considerable after the first few weeks, for it was believed that such losses would result in an almost one-for-one loss of an aeroplane by the enemy. If this should prove to be a correct anticipation of events, it was unlikely that he would persevere in his attempts to penetrate the barrage.

The second kind of loss due to enemy action would be that due to the enemy shooting down the balloons. It was not anticipated that losses from this cause would be considerable, as the task should be a hazardous one in such closely defended localities. If concerted attacks of this kind were made with any frequency it would be a clear indication that the barrage was uncomfortably effective, and its locality could become an excellent rendezvous for defence fighters. Against such attacks, if they were persisted in, occasional balloons carrying considerable charges of high explosive, fired electrically from the ground on the approach of an attacking aircraft, should prove a strong moral deterrent as well as occasionally destroying an attacker.

Besides losses of and damage to balloons which might be occasioned by enemy action the defence anti-aircraft fire would undoubtedly cause certain damage. This damage would mainly take the form of punctures on the top of balloons caused by falling shell fragments. Such holes would be small, deflation would be slow, and there should generally be no great difficulty in repairing them at the winch site without deflation.

The Barrage in Storms

Turning to consideration of the weather, the lecturer said that barrage balloons should be capable of weathering the worst conditions, for it was in such conditions that defence aircraft, lights and guns became least effective. Although practical experience was needed, our present equipment should, according to calculations, be proof against any but violent local winds such as are sometimes encountered in line squalls. Even then there was an element of safety in the fact that such storms seldom occurred at anything but low altitudes and the balloons could generally be expected to be above them.

Electrical storms were, however, a more difficult problem, but he believed that the dangers of losses could be largely reduced by precautions. It might be necessary to lower a barrage in extreme weather conditions, which would also probably prevent aeroplanes from flying.

Air Commodore Hearson concluded with the words: "A balloon barrage, as part of the air defences of London, is almost an accomplished fact. It is not a political stunt and it is not merely a 'scare-crow.' It will be a very real and considerable contribution to the air defences, meeting a requirement which cannot be met by any other means known at present. Further, the elaboration and extension of this form of defence show every promise of becoming practical and valuable in the not-too-distant future."

At the conclusion of the lecture the chairman, Air Chief Marshal Sir Hugh Dowding, who is Air Officer Commanding-in-Chief, Fighter Command, remarked that the balloon barrage ought to be kept mobile so that raiders would never know when they were safe. He also made the striking statement that dive-bombing is not very practical in the Air Force just now because of the great speed which modern streamlined machines would attain in a dive. It would be very difficult to pull them out—if, indeed, they did not break up.

COMMERCIAL AVIATION

FAR EASTERN SURVEY : The Short *Cordelia*, which has recently returned from a survey of the new boat route as far as Singapore, swings at her moorings in Kallang Basin. Singapore airport is in the background and the personnel to be seen are, from the left, First Officer Stone, Capt. Egglesfield and Radio Operator Coster.

THE WEEK AT CROYDON

Static : Full Dress : Damp Encouragement : Festive Freight : Practical Experience

LOTS of fun was had last week by dear old *Horatius*, which took off for Paris on Wednesday carrying the 250,000th passenger to have flown in the "Heracles" class. The passenger was an American lady, and Imperial Airways, it is understood, gave her and her fellow-travellers a slap-up lunch on board. A passenger said that *Horatius* went through every type of weather on the way to Paris except hail and thunder, and behaved admirably throughout, Capt. "Jimmy" Youell being at the controls.

Some travellers return from Paris with a sparkling eye and a tendency to crackle electrically if stroked on the nape of the neck. They become, in fact, ecstatic, if not static. The gay city seems to have had a similar effect on *Horatius*, for, on the way back on Thursday, he met just that hail and thunder which the outward flight had not afforded. There was a flash of blue sparks, an explosive noise and a smell of brimstone, which the superstitious put down to demoniac influences aboard, the cabin being full of Press folk. Experts say it was due to *Horatius* accumulating "glamour," "it," or "static," and then rubbing his flanks against a dense cloud. The moral seems to be that screen stars full of "it" should not rush around when clouds are at the surface, lest they should explode. "Static" seems to be much the same as the villain's pistol on the stage—startling but harmless.

I cannot help sympathising with the gentleman in *Horatius* who was dozing when the big bang occurred and who automatically reached for his faithful bowler and clapped it on. The normal reaction when trouble starts—for example, in a tavern when tankards begin to whizz past one's ears—is to grab one's hat and beat it; moreover, any man, especially if slightly bald, will face any major crisis the better if gravely and suitably hatted. That, quite incidentally, is what is wrong with the Haig statue in Whitehall. Most people don't care whether or not a horse can go for a walk with its front legs whilst its back legs are firmly stuck in Flanders mud, but what they resent is the entire hatlessness of the rider, for anyone, from private to field-marshal, when in uniform, is improperly dressed if hatless. Capt. "Jimmy" Youell displayed the habitual sangfroid of the airline commander, I am told, strolling into the cabin after the incident and reassuring the passengers. A foreign passenger was cheered by the calm faces of the Britons around her. This may be "morgue Britannique," or it may be paralysis of the facial muscles due to extreme alarm and despondency.

There's nothing like encouraging business. What can be jollier than to stand at a counter in the main hall to make an enquiry and to have an extremely accurately aimed stream of rain-water from a hole in the roof pour down the crevice between the back of the neck and the collar? That, when it rains, is the position of the earnest enquirer at the Lep Transport office. The authorities should watch out lest "Tiger" Perkins gets hold of this matter. Talking of this and that, I thought the worst had happened when they started a "knock-knock" system under the windows of several prominent officials here, the object of which—beside making telephoning a mere farce—was the erection of sinister scaffolds similar to that erected in Whitehall for Charles I earlier in history. One visualised people making last confessions, after a tot of rum and a cigarette kindly provided by Government Entertainment Department, and stepping on to the trap-door with a final shout of "Heil Perks!" Trap-door (by Works and Bricks) having inevitably jammed solid three times running, everyone, according to the law of the land, would get a reprieve.

Moving Pictures

We have had an epidemic of enormous, almost windowless wagons like huge dark green Black Marias, or like super motor horse-boxes—the sort of vehicles, in fact, they probably use in Russia for conveying awkward party leaders to execution, or race-horses in England to the bloodstock sales. Men set up poles with red flags on them and people were all of a twitter until it was established that it was not a Perkinsian travelling inquisition, but merely a B.B.C. television outfit. Several shots, practically amounting to still-life, are believed to have been made of an Air Ministry employee digging a pit.

An incident that lead to brisk ear-scratching by experts was when a machine carrying freight only limped home in QBI from the coast with one motor out of action. Could the pilot not have been told to land at, say, Lympne? Passenger traffic was quite seriously affected in that a large aeroplane with fifteen passengers aboard was kept outside the zone whilst the cripple was given preference. The passenger pilot reported ice on wings during his three-quarter-hour unnecessary wait.

A photograph appeared in one Sunday paper of the crew and ground staff of a British Airways machine waving Yuletide indigestibles in the shape of plum puddings. Over fifty tons of such freight, said the newspaper, have left Croydon in a week for English folk on the Continent. Poor folk, to avoid this sort of thing is probably exactly why they exiled themselves. Anyway, experts declare that

there is little danger of plum puddings becoming stale during flight and exploding on contact with the consumer. No data are available, however, in the case of mince pies, which should be handled with caution and rubber gloves.

A new (experimental) uniform for Imperial Airways has been seen here on the graceful figure of Capt. Wilcockson. The R.A.F. pattern, with belt and patch pockets, is abandoned in favour of the more nautical double-breasted reefer jacket. Gold rings on the sleeves, always apt to get worn out on the inner side or to come adrift and hook up in things, are likewise dispensed with, and gold bars on shoulder straps are substituted. Buttons are black, like those of K.L.M. and D.L.H., the idea being, I believe, that for flying-boat crews, anyway, brass buttons tarnish too quickly.

The American Express deserves a hearty pat on the back from air transport people. The other day Mr. Smart, of that company, brought a number of American Express booking clerks from different European countries to Croydon, where they were entertained by Imperial Airways. They saw Air France, K.L.M., Sabena, D.L.H. and other machines and flew in an Imperial machine. It is of the greatest importance that the man behind the counter at a booking agency should know something of the business, and the American Express is therefore to be congratulated on its enterprise in this matter. A. VIATOR.

The African Agreement

THE present agreement concerning the African mails, which was due to expire at the end of this year, will be extended until June 30, 1938, or until an earlier and approved date according to the development of the services. The subsidy for the intervening period will be at the rate of £340,000 per annum, of which the P.M.G. will contribute at the rate of £210,000. The same extension will probably apply in the case of Wilson Airways for their Kisumu-Lusaka service.

This Static

IT was unfortunate for Imperial Airways that the machine which, on December 9, suffered minor damage from an electrical discharge should have been the very one in which a number of Press representatives were travelling. These representatives had been over to Paris to commemorate the carriage of the 250,000th passenger in the H.P. 42 or Heracles class of machine.

The discharge, which occurred with a disturbingly loud explosion when *Horatius* was flying at about 1,000 feet over the middle of the Channel, followed a short period of flying in a severe hailstorm. It is usual for metal machines to become heavily charged in such circumstances and for this reason a length of chain is attached to the tail so that the charge may be earthed immediately after landing. In this case *Horatius* evidently flew into a cloud area of very different potential and the discharge occurred there and then. Fortunately, the trailing aerial had, according to the usual practice in electrically disturbed conditions, been wound in, otherwise the incident might have been rather more serious.

After throttling back and making a cursory examination in the air below the cloud layer, Capt. Youell made for Lympne, where a more thorough examination could be made. The passengers proceeded to London by train.

The New Dewoitines

FOR the first time a Dewoitine 338 has been used this month on Air France's Far Eastern line from Damascus to Hanoi. Eight of these machines have been allocated to the service on which they will replace the Potez 62's introduced quite recently as a stop-gap while the 338's were being made ready. The intention is to have at least six of these machines in operation between Damascus and Hanoi in order to give effect to the new speeded-up time-table which is due to come into force on March 1. The prototype of the D.338 is the *Clemence Isaure* which made its first flight in July, 1935, and is now on the Toulouse-Casablanca-Dakar line.

SIMPLIFYING THE BLIND-APPROACH PROBLEM

IN the days before the ultra-short-wave approach equipment was in regular use at Croydon, Mr. D. N. Sharman was carrying out experiments, with the Air Ministry's temporary blessing, in the north-west corner of the landing area. Experimental work on his particular version of deformed short-wave-beam development still goes on, but at the time when we saw his installation he also described a form of combined blind-approach instrument which he had devised.

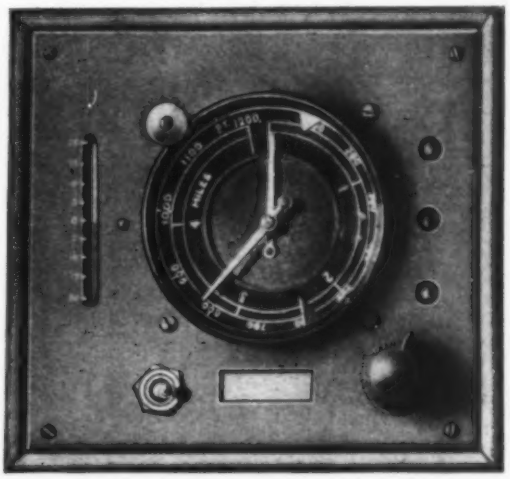
After a good deal of preliminary work the final version of this instrument or panel has now been produced by Short and Mason, the instrument people. The major feature is a dial with two hands, one of which indicates against a scale the distance covered during the approach at any pre-determined ground speed, and the other the machine's height above the aerodrome. The second is set from the normal sensitive altimeter after suitable barometric adjustment has been made.

On the panel carrying the dial there is below it a small fluorescent screen in which cathode-ray indications are given of the directional position of the machines in relation to the beam, while on the right there are the two usual marker beacon indicating glow-lamps, with a third lamp which is set to glow by means of a "landing stick" or cord when the machine reaches a predetermined minimum height. On the left of the dial there is a liquid fore and aft level, and this is the only poor feature of the panel in its present form. Probably it will be removed from later models.

A knurled knob with graduated position marks adjusts the speed of movement of the distance needle according to the conditions of wind and to the best rumbling approach speed of the machine in which the instrument is installed. Two movable pointers on the verge ring of the dial are placed in positions approximating to those of the marker beacons at the particular aerodrome which is being approached. The first of these, as the two needles move round, provides a check on the machine's actual ground speed, since the distance-covering needle should pass it just as the appropriate marker signal indication is seen and heard by the pilot. The other merely provides an "expectation" of the second marker signal.

If the preliminary adjustments and settings have been correctly made, it is obvious that during a blind approach the pilot would endeavour to keep the two needles rotating round the dial together, with the distance-indicating needle always a little ahead of that showing loss of height. Presumably the two needles would, in actual practice be very clearly distinguishable from one another. The time-distance needle is driven by a small electric motor and, with the help of rheostat speed control, would take the place of the dashboard stop-watch which is normally used for checking purposes. The entire panel may be connected to the standard-type of ultra-short-wave receiver.

The idea seems to be a good one, and it is only a matter of seeing that the indications are arranged in a manner which will be entirely satisfactory from the practical point of view. With the usual equipment it is necessary for the pilot to watch his directional gyro, his sensitive altimeter and his stop-watch. He has, consequently, no eyes for anything further, and he must concentrate almost entirely on the aural indications. This instrument, or a development thereof, might simplify the work involved during a blind approach. Mr. Sharman may be reached at 108, St. Paul's Road, N.1.



Mr. Sharman's blind-approach panel as it appears at present. The signal lights are on the right and the directional indications are given in the little screen at the base, on the right of which is the speed adjustment control.

Commercial Aviation

Italy and the South Atlantic

ARRANGEMENTS have now been made for Ala Littoria to extend its activities to South America via the South Atlantic, and fourteen seaplanes and twelve landplanes will shortly be added to the company's fleet. At Monfalcone, a type similar to the Cant Z506, which has an exceptionally long range, is considered to have been chosen for work on the new service. As far as the Mediterranean plans are concerned, it is reported that Rhode Island and Egypt will shortly be linked up with Italy.

Really Large

IT appears that Pan-American Airways have invited eight American aircraft manufacturers to submit tenders for the construction of really large trans-Atlantic flying boats.

These must be capable of carrying a hundred passengers with a crew of sixteen, and must have a range of 5,000 miles at a cruising speed of 200 m.p.h. The payload suggested is, in fact, a matter of 25,000 lb. for this range, and the tenders are invited for three, six, or twelve machines with the option of an additional twelve. Apparently the present visit of Col. Lindbergh, who is chairman of the P.A.A. Technical Committee, to the United States is concerned with this rather magnificent project.

It will be remembered that Short Bros. now have a specially large design in process of development. No figures are, of course, available, but it may be supposed that this boat will be similar in size to the Boeing 314 which has a gross weight of 82,500 lb., and is designed to carry something like forty or fifty passengers on long-range work. The estimated maximum speed of the Boeing is 200 m.p.h. with four 1,500 h.p. (take-off rating) double-row Cyclones.

A New Idea in Airport Control

THE congestion of incoming air traffic at many of the world's large airports, especially in conditions of poor visibility, has created a situation which becomes more and more serious as new schedules are added, and weather conditions exert less restraint on air transport.

To deal with this problem, and to take some of the guesswork out of landings, Capt. Stuart Graham, District Inspector of Civil Aviation in the Department of Transport of Canada, and one of that country's earliest commercial pilots, has for some years past been developing an airport traffic control system which appears to have elicited high praise from officials of the American Bureau of Air Commerce.

His system comprises a wind vane of adequate size and colouring, illuminated at night, and surmounted by a conventional wind sock. Normally this vane swings with the wind and can be made to control, electrically, any number of similar vanes advantageously located on the airport. In the control room or tower is a board on which is mounted a representation of the airport with a needle indicating at all times the bearing of the master vane out in the field. In addition, there is a second representation of the airport with a needle rotated by a knob at the will of the traffic officer.

When this needle is set to indicate any particular runway and the tower control switch is closed, the master vane and all the other vanes on the field will swing to the desired direction or bearing unless there is sufficient wind pressure from some other direction to overcome the electrical control and force the vanes to indicate the true direction of the wind. This last is an important safety feature, and differentiates the system from others of a similar kind. The wind pressure needed to overcome the electrical control can be adjusted to any desired figure and, should the wind subsequently abate, the vanes will return to the position indicated by the second arrow in the control tower. In case of a light wind which may be more or less broadside on to the vane but insufficient to overcome the electrical control, the wind socks will suffice to indicate to a pilot the real direction and approximate force of the wind.

Considerable assistance in the initial development of the device was contributed by the Fairchild Aerial Camera Corporation, and the American Gas Accumulator Company of Elizabeth, N.J., is contemplating the manufacture and marketing of the system in the U.S.

Business Transport

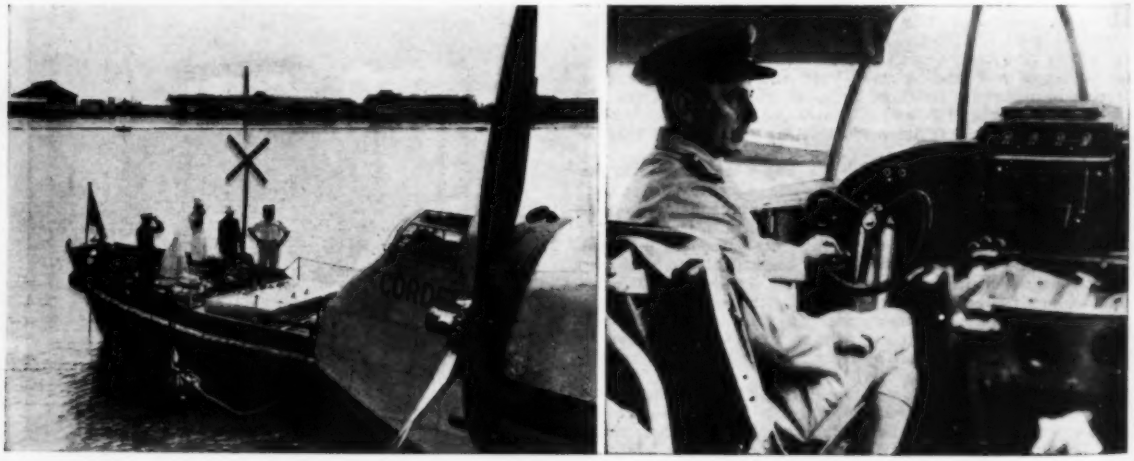
THE pharmaceutical department of the German Dye Trust now owns its own transport aeroplane—a Junkers Ju. 52—for the distribution of its medicines in Europe and elsewhere and for the transport of its personnel. The machine was seen at Croydon on Tuesday of this week after a trip from Cologne in which it brought over normal supplies of various drugs. Needless to say, the advantage of air transport is particularly great where epidemics are concerned, and Beyer Products are one of the first commercial firms to operate its own air service. Batas may be cited as another example.

A British Airways Party

THE first dinner and concert of the engineering staff of British Airways was held at the George Hotel, Crawley, last Saturday. Judging by the success of the evening—nearly a hundred attended—it should become a regular annual event. The committee is to be congratulated on obtaining the services of a conjurer whose tricks mystified even the most sceptical and a comedian whose jokes humoured even the most mournful.

Mr. C. T. S. Capel, chief engineer, who was in the chair, said he was glad such a representative gathering from all departments was present. Major J. R. McCrindle, the managing director, thought that it was time to have a company dinner, and said he realised how difficult it was to keep in touch with all members of the staff in such a growing concern, and regretted he was meeting many only for the first time. He therefore wanted to thank the engineers and all other departments not present for their loyal work, and congratulated those who formed such an efficient technical unit. Major McCrindle also announced that a pension scheme for the staff was to be started.

After Mr. Campbell Orde, operational manager, and a few others had spoken the evening continued to the accompaniment of music, entertainers, and the more usual forms of amusement. At the end Mr. Capel accepted from Mr. Bain a toy pop-gun to help him blow corks out of plug holes when testing engine compressions.



FAR EASTERN SURVEY : Another attractive picture of *Cordelia* in preparation for refuelling at Singapore, with a "close-up" of the commander, Capt. L. A. Egglesfield, in the control cabin. The tropical uniforms seen in this and in the picture on page 610, and the sun-blinds above Capt. Egglesfield make a European winter appear to be particularly hard.

HERE and THERE

HANDY: "Atco" motor lawn mowers (Chas. H. Pugh, Ltd., Birmingham, 9) are proving popular for use in the neighbourhood of clubhouses and other buildings where big aerodrome mowers would be inconvenient.

Fireproofing the Pilot

THAT such a thing as a fireproof flying suit should be considered necessary is an ironic commentary on present-day aeroplanes. But until we achieve some millennium of heavy-oil engines and zero landing speeds the possibility (or probability) of crash-fires must be faced. Therefore, let us praise those who have tackled the problem backwards, so to speak, by fireproofing the pilot instead of his aeroplane.

Most readers are familar with the asbestos rescue suits made by Bell's Asbestos and Engineering Supplies, Ltd., of Slough, Bucks. Some 200 outfits have been supplied to Royal Air Force stations, and have already proved their value.

Now Bell's have carried the good work a stage further by designing, with the sartorial assistance of Gieve's, asbestos flying suits. The problem was not an easy one, for anything resembling the heavy, bulky and grotesque rescue suit was obviously out of the question. The alternative which they have taken is to produce a neat garment which, while lacking the salamander-like qualities of the rescue suit, may well give a pilot time to fight his way out of a burning wreck. Fifteen seconds is the protection period shown by tests, though a man using the suit in a real emergency may very considerably lengthen that period without serious injury. It is obvious that no factory tester of such equipment can discover the absolute period of life protection.

From a short distance the "Bestobell" suit is indistinguishable from the standard Service white drill flying suit, and is complete with all the usual gadgets—pockets, zip fasteners, and so forth. An alternative model is waterproof; its fire-resisting qualities are unimpaired, though it is slightly heavier. Weight, of course, is important, and, surprising as it may seem to those unacquainted with modern asbestos fabrics, these "Bestobell" suits, even when lined with blanket-cloth, show a saving of several pounds over the earlier R.A.F. Sidcot-type kits. The suits can be made in several colours.

Two suits are at present being tested by the Air Ministry. The makers are still busy perfecting details, notably a visor which the pilot can pull down over his face to protect it from the flames, though his goggles constitute rather a problem.

At the Bestobell works we ourselves were allowed to test a mitten of material similar to that used for the flying suit gloves. To hold a hand in perfect comfort in a bath of blazing petrol gave one an oddly pleasant impression of suddenly acquiring supernatural powers!

Incidentally, the manufacture of equipment of this kind is not the firm's only association with the air. Among their productions which we inspected at Slough were some cleverly moulded insulating jackets for Gallay cabin-heaters.

Topical

THE current series of Player's cigarette cards, numbering 50, illustrates the new squadron badges of the Royal Air Force. Translations of the mottoes are given, together with a summarised history of each squadron.

E. G. Brown & Co.

THE accounts of E. G. Brown and Co., of Tottenham, specialists in sheet-metal work for the aircraft and other industries, show a profit of £40,446 for the year ended September 30. A final dividend of 10 per cent. is proposed on the Ordinary shares, making 15 per cent for the period.

Martin-Baker Aircraft

THE address of the Martin-Baker Aircraft Co., inadvertently given in a recent issue as High Wycombe, Bucks, is actually Higher Denham, Bucks.

G.A. Plus B.A.

THAT a merger between General Aircraft, Ltd., and the British Aircraft Manufacturing Co., was imminent has, for some weeks, been an open secret in the industry.

Last week, in letters to their shareholders, both concerns announced that General Aircraft had entered into a provisional agreement to purchase the whole of the ordinary 5s. shares of B.A. on a share exchange basis. One ordinary 5s. share in G.A. is to be allotted in exchange for every two of the B.A.

The directors of both companies stated, in their announcements, that having considered the potential earning capacity and the asset position of the two companies, they had no hesitation in recommending the amalgamation to shareholders. It was stated that neither factory at Hanworth was, at present, large enough to manufacture the largest types of aircraft, but the area between them could be roofed over at a moderate cost, and this would furnish a further 70,000 square feet of space and make a total area of over 300,000 square feet, all on one level, and available for the construction of the largest types. The whole of the factory would have direct access to the aerodrome.

If the two companies were merged there should be a sufficient volume of work, it was stated, to keep both factories working to capacity for a long time to come.

General Aircraft, apart from construction of the Monospar types, have been busy on sub-contract manufacture of complete military aircraft and components for some time past.

Readers will join with *Flight* in wishing the personnel of both organisations happiness and prosperity under the new *regime*.

Milestones in Steel

FOR everyone interested in the austerely romantic story of steel manufacture from the earliest days, there is a wealth of interest in a book, *100 Years in Steel*, issued to commemorate the centenary of the firms of John Brown and Co., Ltd., and Thos. Firth and Sons, Ltd. Here, quoted from many set forth, are just a few of the varied "milestones" in the companies' business:—

1837.—Sir John Brown commenced business on his own account.
1850.—The first crinoline mill to roll steel for crinoline skirts.
1860.—Sir John Brown, a friend of Sir Henry Bessemer, introduced to Sheffield the Bessemer process of steelmaking.
1863.—The Lords of the Admiralty visited Atlas Works and saw the rolling of a 20-ton armour plate.
1871.—Thos. Firth and Sons built the famous "Woolwich Infant," 35-ton gun.
1871.—Chromium steel was made at Atlas Works for the first time in England.
1879.—John Brown and Co. Ltd., adopted the new Siemens furnaces for steel melting.
1886.—Thos. Firth and Sons, Ltd., commenced manufacture of chromium armour piercing shell.
1900.—Firth's began the manufacture of high-speed tool steel.
1901.—Firth's opened a file factory at Riga.
1905.—John Brown and Co., Ltd., built the *Lusitania*.
1913.—The discovery of stainless steel in the Brown-Firth Research Laboratories.
1918.—Firth's 4,000-ton forging press erected.
1920.—The Battle Cruiser H.M.S. *Hood*, built by John Brown and Co., Ltd., delivered to the Admiralty.
1923.—Development in the Brown-Firth Research Laboratories of the "Staybrite" corrosion-resisting steels.
1931.—A 30-ton electric-arc furnace, the largest in Europe, laid down by Firth-Brown.
1934.—Firth-Brown arranged to take their electrical power from Sheffield Corporation. Annual consumption amounted to nearly 100,000,000 units and in addition the works used 1,000,000,000 cubic feet of gas and 150,000 tons of coal.
1937.—Arc-electric steel ingots cast by the Company weighing between 50 and 60 tons each.

Sqn. Ldr. England's New Post

AFTER severing his connection with Aero Engines, Ltd., Sqn. Ldr. Tom Harry England has joined the Austin Shadow Factory on the aircraft side. His wide experience should be valuable to the firm in connection with the Fairey Battles when they begin to emerge in a steady stream demanding flight-testing.

Distribution of "Perspex"

OWING to an inadvertent confusion of headings, the paragraphs appearing under the names of Mouldrite, Ltd., and Triplex Safety Glass Co., Ltd., in our review of the ancillary industry (December 2), may have given an inaccurate impression.

Actually, the shaping and subsequent distribution of the former company's "Perspex" in the United Kingdom and elsewhere is not the sole right of one firm; it is, in fact, being carried out by more than one firm, and is open to all who may wish to engage in such work.

In this connection it is worthy of note that among these firms is Plastilume Products, of Humes Avenue, Hanwell, who are producing large quantities of windows, windscreens, gun turrets, landing lights, etc., in this and other transparent materials.

International Aircraft Activities

APART from their work on the Marendaz monoplane, which should soon be making its appearance, International Aircraft and Engineering, Ltd., are now in a position to undertake sub-contract work in their new factory at Barton, Beds.

Actually, for some time past their machine shop has been active, and they state that in every Short-Mayo upper component that flies the Atlantic there will be sixty-four rocker boxes completely machined by them (there are twenty-seven operations on each), sixty-four push-rod yokes, and four gas distributors, all from their shops.

The firm, of course, is also responsible for the Marendaz flap, which may go a long way towards solving the current problem of providing high lift for take-off and plenty of drag for approach.

Short Bros.' A.G.M.

AT the annual general meeting of Short Bros. (Rochester and Bedford), Ltd., Mr H. O. Short, F.R.Ae.S. (the chairman), said that during the past year very satisfactory progress had been made with regard to output. Of the original order for 28 Empire flying boats which they had received from Imperial Airways, 26 have been delivered to that company and they expected to complete the order by the end of this year, thus strictly fulfilling their promises of delivery. They had received further substantial contracts from Imperial Airways for commercial boats of an advanced type. [These boats are considerably larger than the Empire type; beyond that nothing may be disclosed at present.] They also had very substantial aircraft orders from the Air Ministry in consequence of the rearmament programme.

Speaking of the Short and Harland factory at Belfast, Mr. Short said it was nearly two-thirds the size of the biggest factory for aircraft construction erected under the shadow factory scheme, and there was ample room for further extension if the necessity arose. The factory was now practically completed and already 1,200 men were employed.

Mr. Short expressed his gratitude to his staff for their excellent team work, particularly Mr. Gouge (general manager), Mr. Bibby and Mr. Kemp (production managers), and Mr. Wood (secretary).

A proposal to pay a dividend of 30 per cent., plus a bonus of 10 per cent., on 470,000 Ordinary shares, 250,000 "A" Ordinary shares, was carried unanimously.

One part of Mr. Short's speech which was loudly applauded was the announcement of a staff pensions scheme, for which a sum of £10,000 was allocated, plus £30,000 which he personally placed at the disposal of the directors to form a trust fund from which pensions might be augmented in special cases.

British Marine Aircraft

AT the second annual general meeting of British Marine Aircraft, Ltd., held last Friday in London, the chairman, Mr. A. P. Good, said that the new board were faced with a considerable problem when they took over control. Briefly it might be summarised by saying that they had to stop the losses, put the company on a profit-earning basis, suggest a scheme of capital reorganisation that would bring the capital in line with the remaining assets, and develop a programme that would give the company a livelihood after the present expansion in armaments is over.

It was comparatively simple to say these things, but much more difficult to put them into effect. The board had, however, been able to move the company to a great extent in the right direction. They had been able to increase the productive staff, the output, and the orders in hand. They had been able to reduce the overheads.

At an extraordinary general meeting, held subsequently, resolutions were passed approving a proposal to write down the capital by £200,000 and another to change the name of the company to Folland Aircraft, Ltd.

The name of Folland has been a familiar one in the British aircraft world for more than twenty years. First at the Royal Aircraft Factory (as it then was), then with British Nieuport and afterwards with the Gloster company, the name of Mr. H. P. Folland has always been closely associated with high-speed aircraft, and even at the present time aeroplanes of his design equip a very large proportion of the fighter squadrons of the R.A.F. It is to be hoped that the company which now bears his name, and with which is associated several technicians who have worked with Mr. Folland for a great number of years, will soon be permitted to contribute its aircraft quota to the rearmament programme.

Aerial Photography

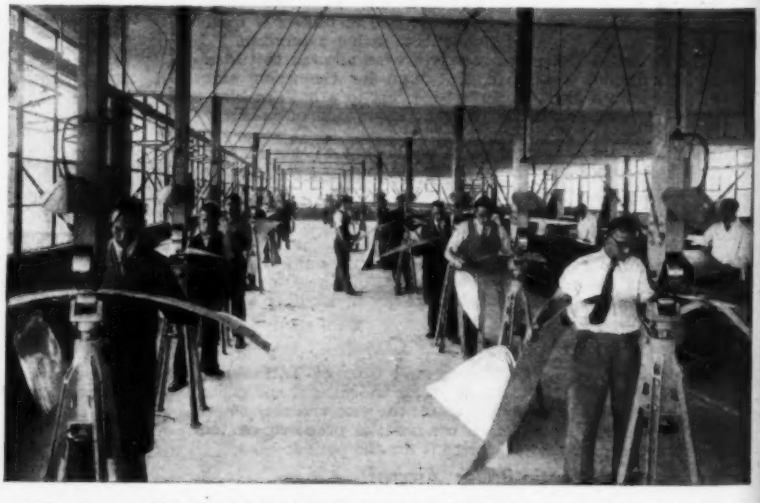
TO the companies specialising in aerial photography mentioned recently, should be added the name of Aero Pictorial, Ltd., of Chesham House, 136, Regent Street, W.1. The company was formed by Mr. C. E. Murrell in 1934, since when their work has included contracts from municipal authorities and many important industrial concerns. Mr. Murrell's co-directors are Capt. A. N. Kingwill, of Airports, Ltd., at Gatwick; and Mr. L. H. Stace, of Air Commerce, Ltd., Heston.

"SERVICE" EXTENDED

AMONG the many new works which are springing up to deal with the increasing amount of aircraft sub-contract work is that of Fox and Nicholl, Ltd. The premises, which have an unusually large amount of window space, are situated behind their attractively laid out service station, which is a landmark for motorists on the Kingston By-pass, near Surbiton. Through special planning it will be possible to add a third floor within one month if required.

Sheet metal work is the main business of the firm, but jigs and tools for the work are also produced on the spot, so that, in effect, a sub-contract order is handled from start to finish.

On the first floor are twenty-one wheeling machines for producing aircraft panels from Alclad and duralumin; the jigs are kept by the machines. On the ground floor smaller jobs—e.g., ammunition boxes, air intakes, aircraft seats, map cases and various fairings—are produced and some of the larger work, such as wheel spats, finished off. The guillotines are on the ground floor. Among important names on Fox and Nicholl's books are Bristol, Vickers and Parnall



Wheeling machines handling sheet-metal aircraft work in one of the well-lighted shops of Fox and Nicholl, Ltd.